FLIGHT
and
The AIRCRAFT ENGINEER

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The Outlook

The Royal Air Force

DURING the first eight months of the war the Royal Air Force has shared with the Royal Navy the task of protecting this country from attack by the enemy, and has done invaluable work in patrolling the North Sea and the eastern part of the Atlantic; in attacking enemy bases in the North Sea and Baltic; in reconnaissance flights over Germany, extending far to the east into Bohemia and Austria; in Army co-operation work and reconnaissance; and last but not least, in fighting and driving off such German bombing and reconnaissance attacks as have been launched against towns on the east and north-east coasts and on Scotland.

Recent events in Norway indicate that the war may now be entering upon a new phase, and we have thought this an opportune moment for bringing out a special issue devoted to the constitution, organisation and work of the Royal Air Force.

From the favourable comments we have received from readers after publication of the histories of aircraft firms which have appeared we know that our readers appreciate such references to "the old flying days." (Major C. C. Turner will, we are sure, forgive us for borrowing the title of his book.) Bearing this in mind, we have included a section devoted to the birth, growth and work of the R.A.F. In this Captain Macmillan recalls the events and circumstances which led up to the amalgamation of the Royal Flying Corps and the Royal Naval Air Service into the present Royal Air Force. He also gives a brief account of the work the older services and the new R.A.F. did in the war of 1914-18.

In addition, there are special articles dealing with general training in the R.A.F., with flying training at an initial training school, and a pictorial representation of the work of the different branches of the service.

Although less spectacular, the work done by the Royal Air Force overseas is of the highest quality and of the very first importance. An article is devoted to outlining the nature of this work.

This year we have had to give the information concerning the types of aircraft used in the Royal Air Force in as short and concise form as possible, but it is believed that it is presented in a way which makes for easy reference.

Lessons from Norway

ADMITTEDLY the failure of the Allied troops to maintain and establish themselves at Namsos and Aandalsnes was due to the work of the bombers of the *Luftwaffe*, to the action of which no effective defence could be opposed.

The surprising feature of the operations has been the failure of our own bomber force to put a stop to the German activities. The word "failure" implies no discredit to the R.A.F. The courage with which they pressed through intense A.A. fire and bombed the aerodromes in Norway and Denmark has been heroic. There are not many aerodromes in Norway, and they are all within the range of our bombers. Our machines plastered and pitted the landing grounds and runways, destroyed buildings, set petrol stores on fire, and damaged large numbers of German machines on the ground. Yet, despite all this, the German bombers continued to do their work and carried it through to the point of forcing our troops to evacuate their positions on both sides of Trondhjem. How they managed to carry on is, on the face of it, a mystery; but carry on they did. Are we to conclude that air attack on aerodromes is an ineffective and unprofitable operation? We know by now that bombers cannot put a "Veto" on the work of fleets; are the activities of aerodromes equally impervious?

OFFICIAL War Communique No. 1, issued on September 4th, 1939, the second day of the war, stated that a successful attack had been carried out during the afternoon by units of the Royal Air Force on vessels of the German Fleet at Wilhelmshaven and at Brunsbüttel, at the entrance to the Kiel Canal.

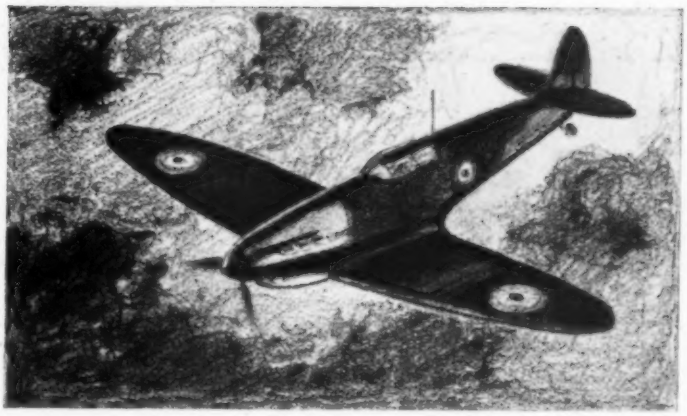
The R.A.F. had struck, and struck hard.

That Kiel raid by Wellingtons and Blenheims of the Bomber Command gave Germany the first taste of the medicine which was later to be administered in even stronger doses. The frequency of these has been governed by the mutual adoption of a policy which has spared industrial targets and civilian life, though one can never tell when this will be abandoned by Germany.

There is no need here to recount in detail the exploits of aircraft of the Bomber Command—the early leaflet raids and deep reconnaissance flights under appalling weather conditions; "Security Patrols" over the bases of Germany's minelaying seaplanes; the destruction of twelve Messerschmitt fighters for the loss of seven Wellingtons; the plastering of Sylt with forty-five tons of bombs in a night; and the repeated long-distance raids over Norway. These deeds, and scores besides, are fresh in the public mind and evergreen among the honours of the Service.

The Bomber Command comprises squadrons equipped mainly with Vickers Wellington, Armstrong Whitworth Whitley, Handley Page Hampden and Hereford, and Bristol Blenheim

Brilliant Offensive Operations : Home Defence : On the Western Front : Equipment and Armament



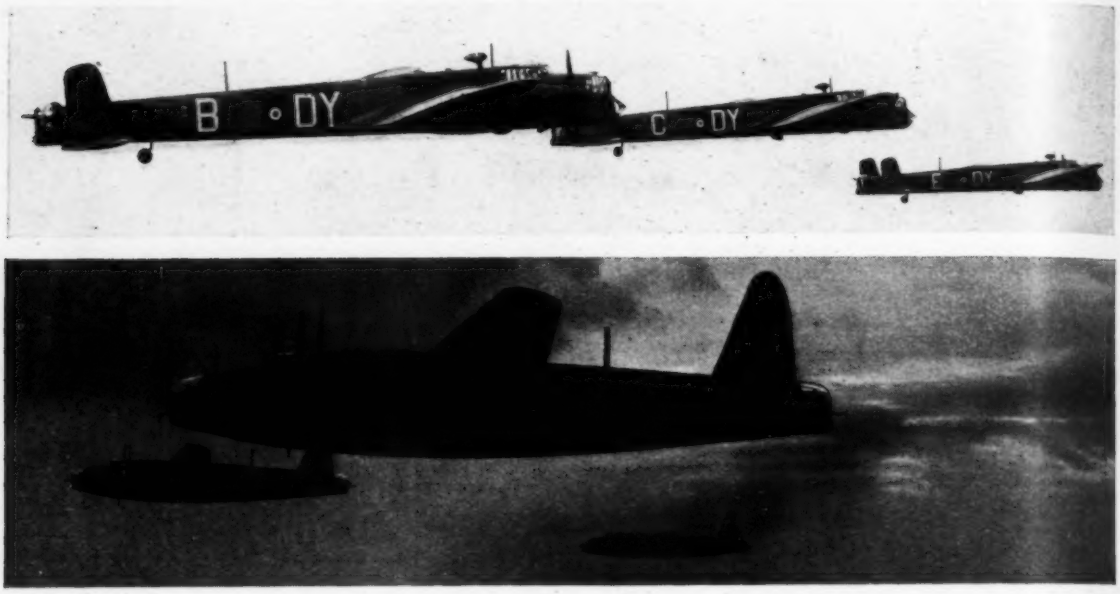
aircraft. The all-round excellence of these machines has already been proved and their superiority in certain respects to comparable enemy types established. The Wellington and Whitley, and to a lesser extent the Blenheim, have demonstrated the effectiveness of the power-driven gun turret, a device in the development of which Great Britain is pre-eminent. The Nash and Thompson turret as installed in the tail of the Whitley can be traversed, elevated or depressed at astonishing speed while firing .303 bullets at the rate of 4,800 a minute. On the Wellington there are also four rear guns, two in the extreme tail and the second pair in a completely rotatable and retractable turret beneath the fuselage.

The value of such heavy armament is, of course, greatest when several machines so equipped are flying in close formation, as was demonstrated so forcefully over the North Sea on December 18 last year when a formation of Wellingtons met a very formidable force of Me 109 and 110 fighters. According to the leader of the Wellington formation, twenty-five Messerschmitts were seen between Heligoland and Wilhelmshaven. After the battle had begun the Wellingtons continued on their course, fighting as they went. When they turned for home some of the Messerschmitts followed, and one of our machines, becoming detached from the formation, was set upon in force. The pilot brought the machine down to sea level to prevent the fighters getting under his tail. His rear gunner shot down two of the enemy, but was shortly afterwards wounded by a third. With the under guns and wireless damaged the second pilot took the rear gunner's place and found that the ammunition in that position had been expended. A moment later the front gunner was wounded and the reserve pilot scrambled to the front gun, where he found plenty of

ACHIEVEMENTS OF THE R.A.F. TO DATE

Sept. 4, 1939.—Raid on Kiel.
Sept. 8, 1939.—Leaflet raid on Kassel, 185 miles S.W. of Berlin.
Sept. 21, 1939.—Crew of *Kensington Court* rescued by flying boats.
Sept. 29, 1939.—Attack on German Fleet in Heligoland Bight. Five aircraft lost.
Oct. 1, 1939.—Five R.A.F. reconnaissance aircraft *v.* fifteen Messerschmitts. Three British and two Germans shot down.
Oct. 2, 1939.—Leaflet raid over Berlin.
Oct. 9, 1939.—Entire German Frontier from France to North Sea reconnoitred by four aircraft. No losses.
Oct. 16, 1939.—First raid on Firth of Forth defeated. Four raiders shot down.
Oct. 25, 1939.—Reconnaissance flights over Berlin, Magdeburg and Hamburg.
Oct. 28, 1939.—More reconnaissance flights. Intense cold and ice formation.
Nov. 11, 1939.—Reconnaissance flights over Stuttgart, Mannheim and Nuremberg. One machine lost.
Nov. 22, 1939.—Reconnaissance over Stuttgart, Frankfurt, Hamburg and Bremen.
Nov. 23, 1939.—Seven enemy aircraft shot down in France by R.A.F.
Nov. 24, 1939.—Nineteen enemy aircraft brought down in last two days.
Nov. 25, 1939.—Reconnaissances over Wilhelmshaven and Heligoland.
Nov. 28, 1939.—Long-range fighters attacked Borkum seaplane base.
Dec. 2, 1939.—Coastal Command aircraft shepherded merchant ships clear of mines.
Dec. 3, 1939.—Warships at Heligoland attacked.
Dec. 15, 1939.—Reconnaissance of Borkum, Nordeney and Sylt.
Dec. 17, 1939.—*Graf Spee* scuttled. One Fairey Seafox spotted for guns during action.
Dec. 18, 1939.—Twelve Messerschmitts shot down by our bombers at Heligoland. Seven British aircraft lost.
Dec. 27, 1939.—Coastal Command aircraft attacked enemy destroyers and patrol boats off German coast.
Jan. 13, 1940.—Long reconnaissance over Austria, Bohemia, and N.W. Germany.
Jan. 31, 1940.—U-Boat sunk by flying boat and warship.
Feb. 2, 1940.—Seven men on raft rescued with aid of aircraft.
Feb. 3, 1940.—Heinkel brought down near Whitby in Yorkshire. First down on English soil.
Feb. 17, 1940.—Lockheed Hudsons spot *Altmark*.
Feb. 27, 1940.—Baltic seaports reconnoitred by R.A.F.
March 7, 1940.—Two Heinkels shot down over North Sea. Reconnaissances over N.W. Germany and Prague.
March 16, 1940.—Scapa Flow raided by Germans. One shot down, others driven off.
March 19, 1940.—Raid on Sylt lasting seven hours. Forty-five tons of bombs dropped.
March 28, 1940.—Five Me 109s brought down on Western Front.
April 2, 1940.—Sunderland successfully drove off six attacking Junkers Ju 88s.
April 3, 1940.—First Spitfire crashed in sea off English coast.
April 4, 1940.—Wilhelmshaven raided. Damage believed done.
April 9, 1940.—Bombers attacked German ships in Bergen fjord.
April 10, 1940.—Sixteen Skuas dive-bombed cruisers at Bergen. Three direct hits claimed. Dornier brought down in thirty-five seconds by Hudson in North Sea.
April 11, 1940.—Torpedo-bombers sunk destroyer at Trondhjem. Stavanger aerodrome bombed.
April 13, 1940.—Ships at Bergen bombed.
April 15, 1940.—Stavanger bombed again.
April 16, 1940.—Bergen bombed again. One transport and one submarine sunk. Trondhjem bombed.
April 18, 1940.—Seven attacks delivered on Stavanger to date.
April 20, 1940.—Aalborg, in Denmark, bombed. Also Stavanger and Kristiansand.
April 22-23, 1940.—Aerodromes at Oslo bombed. Also Aalborg again.
April 23-24, 1940.—Raids on Fornebu, Stavanger and Kristiansand. Aalborg (fourth time) and Westerland on Sylt also bombed.
April 25, 1940.—Supply ships in Hardanger and Granvin fjords bombed. Places in Oslo fjord bombed, including oil refinery.
April 26, 1940.—Blenheim attacked two Dornier flying boats. One believed crashed. Five of our machines lost in last two days. Announced that R.A.F. fighters in Norway.
April 30, 1940.—He 111 crashed at Clacton.
May 1, 1940.—Stavanger, Fornebu and Aalborg bombed again.
May 2, 1940.—Sunderland attacked on water in fjord. Took off and shot down one Me 110.

THE R.A.F. AT WAR (CONTINUED)



Big bombers: Armstrong Whitworth Whitleys (top) and Vickers-Armstrongs Wellingtons (below) are two of the key types operating with the Bomber Command. Both machines have put up a magnificent showing when attacked by enemy fighters, their armament being five machine guns each. These are mounted in power-driven turrets.

ammunition. Finally the Wellington got away, having accounted for four or five Messerschmitts.

Thus do our big bombers fight. The German bombers are, or were originally, designed to a different formula; they represent the "evasive" type, lightly armed and fast, on the lines of our Blenheim. The pilots depend on the performance of their machines and on the protection of clouds to elude fighters. In clear weather, against our multi-gun Spitfires and Hurricanes, they have suffered very severely, though during the winter many managed to make their escape into clouds.

It is likely that the Germans will henceforth specify heavier armament for the larger types of bomber. They are not entirely ignorant of the possibility of gun turrets, for they have conducted experimental work during the past few years and at least one Nash and Thompson turret has come into their hands.

On the only types of R.A.F. multi-engined bomber not fitted with turreted armament, the Hampden and Hereford, the rear armament has been doubled, and the Germans have very good reason for tackling these excellent machines with caution.

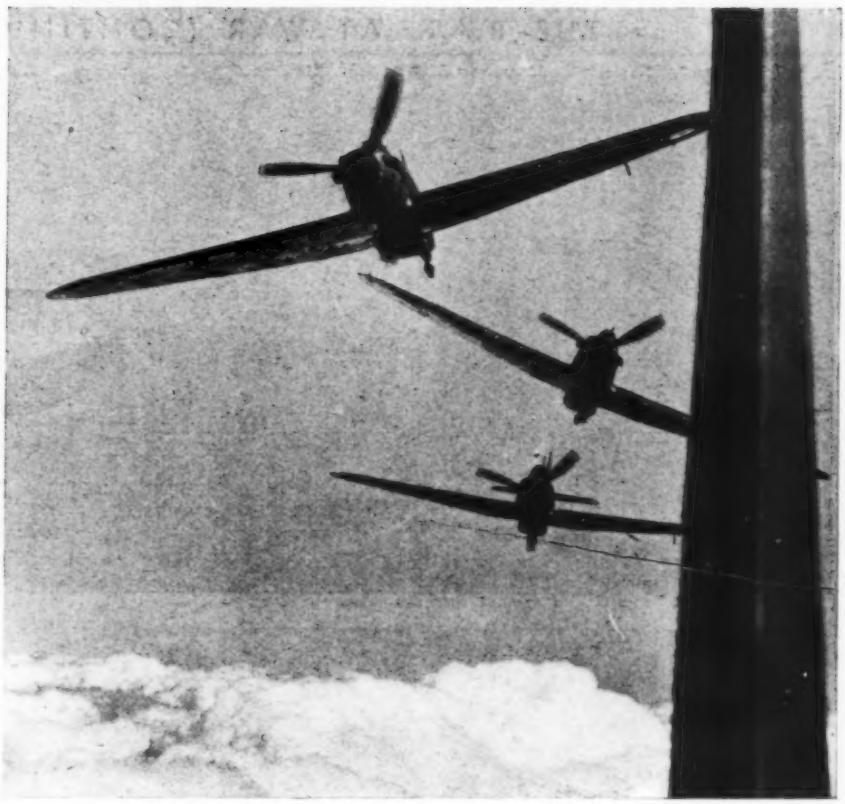
In its numerous attacks on enemy bases and ships the R.A.F. has employed the high, medium and low methods of bombing with success. Exemplifying the determination of our bomb-aimers, there is the story of the one who, with his machine imperilled by intense anti-aircraft fire over Sylt, requested the pilot to run up to the target again, as on the first attempt he was not quite happy about the accuracy of his sighting.

The Spitfires and Hurricanes of the Fighter Command have profited as much as the bombers by their superiority in armament over the enemy bombers and single-seaters. These outstanding machines carry a heavier armament load than any foreign single-seater in service; eight 0.303in. machine guns firing at the combined rate of 9,600 rounds a minute. Shell-firing guns are fitted to certain machine of the type, but this sort of armament has not been employed by the R.A.F. to the same extent as by the *Luftwaffe*.

But there are other factors besides heavy armament which have contributed to the success of our Home Defence fighters: excellent flying qualities and powers of manœuvre; accurate guidance from the ground; and the vigilance of the Observer Corps. At times the task of the fighters has been extremely difficult and conditions exasperating. For example, at the end of January Great Britain was buried under

The Bristol Blenheim has distinguished itself in the war as a bomber, fighter and strategical reconnaissance aircraft. The Mark IV version has a top speed of 295 m.p.h. and a range of 1,900 miles.

THE R.A.F. AT WAR (CONTINUED)



Hawker Hurricane eight-gun fighters as seen from the gunner's cockpit of a Fairey Battle flying over France. The Hurricane has proved outstandingly successful against enemy fighters, bombers and reconnaissance aircraft.

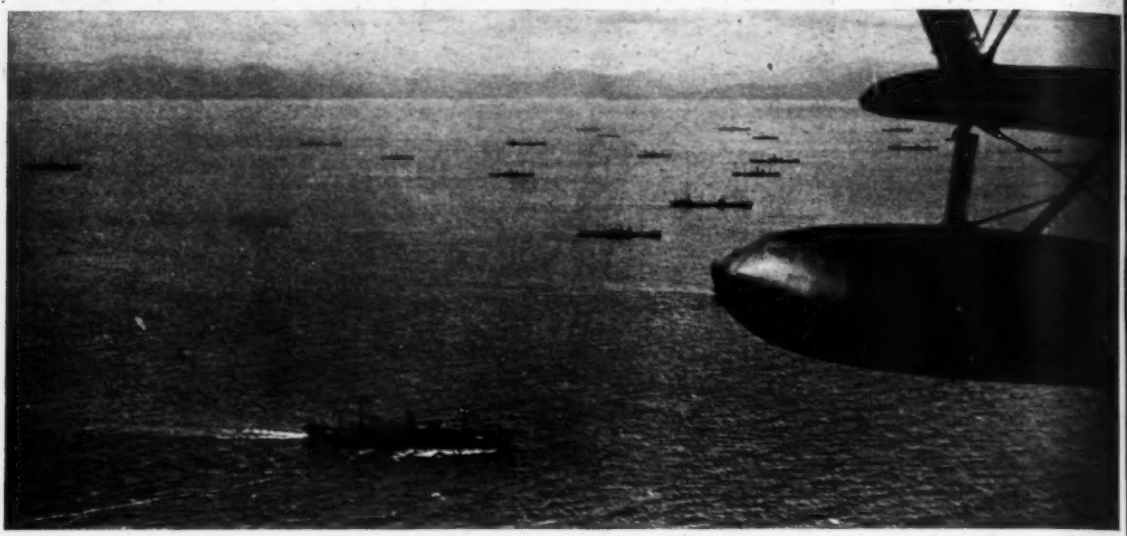
snow. Knowing that our railways and roads were blocked the Germans may have assumed that the aerodromes of the Fighter Command would be inoperative. But they did not know of the means taken to keep our fighter patrols in the air; that all ranks were working to maintain the surface of the aerodromes in a serviceable condition. The work was done so well that a squadron which brought down three, and perhaps four, Heinkels in six days was able to do many hours' night flying.

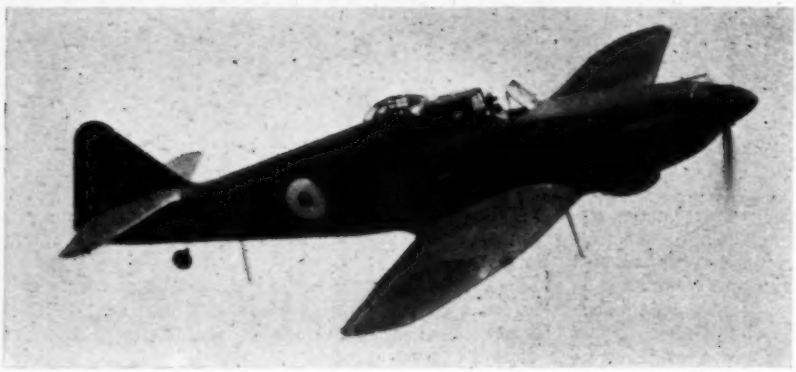
Our Home Defence fighters have, up to the present, had to tackle only bombers and reconnaissance aircraft, but in France our Hurricanes have had numerous battles with Messerschmitt fighters of the types 109 and 110, in which their heavy armament and outstandingly fine handling qualities have enabled them to establish a marked superiority. Recently on the Western Front three Hurricanes engaged twelve Me 109s, which were flying in close formation. Two of the British were too low to join in to the best advantage, but the higher one immediately pressed home the attack, and separated two machines from the remainder of the formation. After a while one German went down in a spin, and although his Hurricane had been shot about, the British pilot nevertheless turned on the second machine and chased it back to its aerodrome, where a dog-fight ensued. Finally, the German made the mistake of zooming up in front of the Hurricane, making an almost perfect target. A burst from the eight Brownings sent him down in flames.

Blenheim twin-engined long-range fighters, apart from doing very fine work as Home Defence machines, have been used for low-flying attacks with distinct success. Up to the present there have been no reports of actions by our new Boulton Paul Defiant two-seater fighters.

Although nothing has been heard of Westland Lysander army co-operation aircraft in action, the machines are doing a very useful job of work until such time as they are called upon to operate against the enemy. The newest version of the Lysander in service has a Bristol Perseus XII sleeve-valve engine.

THE R.A.F. AT WAR (CONTINUED)





(Above) Flying boats and landplanes of the Coastal Command daily co-operate with convoys apart from making long over-water reconnaissance flights. They have been in action against enemy aircraft on a number of occasions.

On the left is a Boulton Paul Defiant two-seater fighter with a four-gun power-driven turret. Machines of this type are now being issued to certain R.A.F. squadrons.

Units of the Balloon Command are doing a highly commendable job of work not only in this country but in France.

The Defiant is equipped with a four-gun Boulton Paul power-driven turret and should prove a very sharp thorn in the side of the raiding Germans.

The activities of the Coastal Command have brought honours on this branch of the Service. The aircraft used are not only flying boats (Short Sunderland, Saro Lerwick, Supermarine Stranraer and Saro London) but the economical and dependable Avro Anson landplane, and the larger, faster American-built Lockheed Hudson. The reconnaissance and patrol flights and anti-U-boat expeditions hundreds of miles out to sea in the filthiest of wintry weather, have been creditable enough in themselves, but a source of further satisfaction has been the ability of Coastal Command machines not only to look after themselves but to give a very hot time to any enemy aircraft they may encounter. The little Anson and the Hudson have both tackled enemy marine aircraft successfully and the Sunderlands—the largest aircraft in regular use in the R.A.F.—have acquitted themselves with honours against Ju 88 high-speed bombers. Not only the Merchant Navy but the Fleet has good reason to bless the Coastal Command. Many lives have been saved by its efforts.

That we do not make a longer reference in this brief commentary to the other R.A.F. Commands is due only to lack of space and to the fact that their work has not brought them into contact with the enemy. Their patient and encouragingly fruitful efforts are nevertheless deserving of congratulation.

ROYAL AIR FORCE RANKS and BADGES

Badge of Observer.

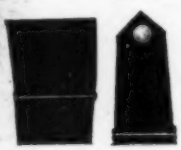
Pilot's flying badge.

Badge of Air Gunner.

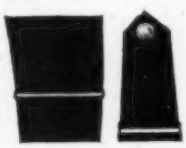
Cap peak and cap badge of officer of Air rank.

Chaplain's cap badge.

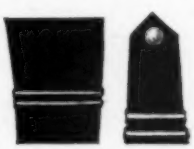
Cap badge of officer below Air rank. Cap peak of Group Captain.



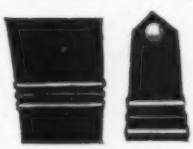
Pilot Officer.



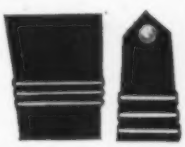
Flying Officer.



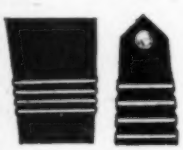
Flight Lieutenant.



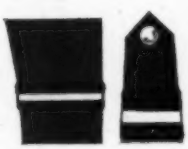
Squadron Leader.



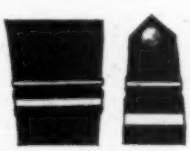
Wing Commander.



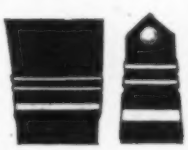
Group Captain.



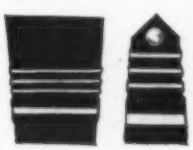
Air Commodore.



Air Vice-Marshal.



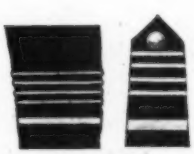
Air Marshal.



Air Chief Marshal.

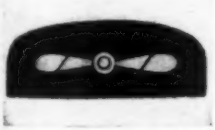
Medical Officer's collar badge.

Sleeve badge of Air Branch, R.N



Marshal of the Royal Air Force.

Chaplain's collar badge.



Leading Aircraftman.

Corporal.

Sergeant.

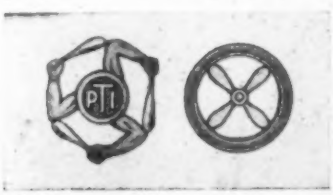
Flight Sergeant.

Warrant Officer.

Wireless Operator.

Bandsman.

Drum Major.



Physical Training Instructor. Apprentice or Boy Entrant.

AIR CREWS
OBSERVER
PILOT
WIRELESS OPERATOR-AIR GUNNER
AD ASTRA
This diagram shows the organisation of the Royal Air Force. A man entering through the gateway may (on the right) find himself an airman and an aircraftman; on the left a specialist officer; at the top a member of an air crew. It is not possible to depict all the branches for officers (e.g. medical) and trades for airmen (e.g. blacksmith), but a representative selection is given here.
GROUND OFFICERS
ENGINEER
EQUIPMENT
ARMAMENT
INTELLIGENCE
NAVIGATION
LEGAL
PHOTOGRAPHIC
ACCOUNTANT
METEOROLOGICAL
SIGNALS
BALLOON
AIRMEN
FLIGHT MECHANIC
MOTOR DRIVER
DISPATCH RIDER
MOTOR BOAT CREW
REP
FITTER
FLIGHT RIGGER
ARMOURER
PHOTOGRAPHER
INSTRUMENT MAKER
CLERK
ELECTRICIAN
BALLOON OPERATOR
WIRELESS OPERATOR
RADIO MECHANIC
RAF

(Left) Air Chief Marshal Sir Hugh C. T. Dowding, G.C.V.O., K.C.B., C.M.G., A.D.C. (A.O.C.-in-C Fighter Command).

(Right) Air Vice-Marshal C. F. A. Portal, C.B., D.S.O., M.C. (A.O.C.-in-C. Bomber Command).

(Top left) Air Marshal A. S. Barratt, C.B., C.M.G., M.C. (A.O.C.-in-C. British Air Forces in France).

(Left) Air Chief Marshal Sir Arthur M. Longmore, K.C.B., D.S.O. (A.O.C.-in-C. Middle East Command).

(Bottom left) Air Chief Marshal Sir John M. Steel, G.C.B., K.B.E., C.M.G. (until this week A.O.C. Reserve Command).

(Top right) Air Chief Marshal Sir Frederick W. Bowhill, K.C.B., C.M.G., D.S.O. (A.O.C.-in-C. Coastal Command).

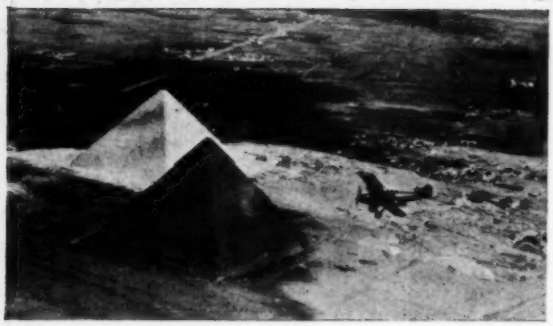
(Right) Air Vice-Marshal Sir O. T. Boyd, C.B., O.B.E. (A.O.C. Balloon Command).

(Bottom right) Air Vice-Marshal P. H. L. Playfair, C.B., C.V.O., M.C. (A.O.C. Advanced Air Striking Force, France).

(Above) Air Chief Marshal Sir Cyril L. N. Newall, G.C.B., C.M.B., C.B.E., A.M. (Chief of the Air Staff).

(Left) Air Vice-Marshal J. T. Babington, C.B., C.B.E., D.S.O. (A.O.C. Far East Command).

(Right) Air Vice-Marshal Sir J. S. T. Bradley, O.B.E. (A.O.C. Maintenance Command).



THE OVERSEAS COMMANDS

Varied Tasks of the R.A.F. in the Empire

THE various communiqués issued since the outbreak of war have by this time made most people familiar with the three Home Commands which take an active share in the fighting, namely, the Bomber Command, the Coastal Command, and the Fighter Command. The Coastal Command has been very busy co-operating with the Navy, sending its flying boats and its Hudsons over the seas to reconnoitre. The Fighter Command is for the air defence of this country, and has been happily shooting down Heinkels and other German machines which have approached our coasts, only irritated because it could not find more of them to shoot down. The Bomber Command has remained flexible, helping the Navy by patrolling the Frisian Islands, preparing for the future by flying over Germany, and of late helping the Army by incessant bombing of German air bases in Norway.

The Overseas Commands are naturally less familiar to people in this country. There are six of these Commands, and each one has duties of its own, and is quite unlike any other Command. The nearest and the smallest of these Commands is that in the Mediterranean. Its duties in normal times are purely those of naval co-operation, and in those times its only unit which could fire a shot in anger was one squadron of flying boats. Of course if the war spread to the Mediterranean the situation would become very different, and the Command might well find itself in charge of aggressive and defensive air forces.

The Middle East

Moving eastward, we next come to the Command of the Middle East. This is the most important Overseas Command, and to mark its importance the officer at the head of it has been given the title of Air Officer Commanding-in-Chief. He is the only A.O.C.-in-C. outside Great Britain. While Marshal Weygand and General Wavell are mustering a growing force of all arms in Syria and adjacent parts, it would naturally be out of the question to mention the present composition of the R.A.F. in the Middle East. All that can be indicated is its scope in peacetime. The headquarters of the Command are in Cairo, and its control extends over Egypt, the Sudan, and Kenya. For the purposes of training and organisation it is also over the R.A.F. units in Palestine and Trans-Jordan, though they are under Army orders for operational purposes. That means to say that when there is fighting in Palestine the General Officer Commanding tells the air squadrons where to go and what to bomb or machine gun. The air units in Palestine include a company of armoured cars.

Egypt is an independent and allied kingdom, and the stationing of R.A.F. units in the centre of that country is only a temporary measure. The treaty between the Kings of the United Kingdom and Egypt has arranged that the R.A.F. units shall all be stationed in the Canal zone as soon as that can be arranged, as Britain has special interests in the defence of the Canal which Egypt has recognised. The Command includes No. 4 Flying Training School at Abu Sueir. Since Italy's annexation of Ethiopia fighter squadrons have been included in the Middle East Command, and one squadron was stationed at Nairobi in Kenya. The Middle East is a sort of pivot Command, and must be ready for various kinds of eventualities. If the war should extend eastwards this Command may have a very important part to play.

If we sail farther to the East we come to another small but very active Command, known as British Forces in Aden. In peacetime the air units at Aden are only one bomber squadron and one section of armoured cars, but there are certain Army units there, gunners and sappers, as well as local levies, all of which come under the orders of the Air Officer Commanding. The main duties of the Command are to enforce the *Pax Britannica* among the unruly tribes of the Aden hinterland, and active operations are often in progress. Air control has proved not only very effectual, but also very economical in money and in saving bloodshed, both on our own side and also among the tribesmen. They cannot fight the aircraft, and so are bound to submit sooner or later. Blockade of the villages always settles the matter without any need to bomb the tribesmen themselves.

From Habbaniyah to Hong Kong

British Forces in Iraq is another highly important Command. Iraq is, like Egypt, an allied kingdom, which by treaty agrees to the presence of the R.A.F. Certain Iraq levies come under the A.O.C., and if and when units of the British or Indian Armies are needed in the country they are also under his orders. The air branch of the Iraq Army now undertakes the internal pacification of the country.

Then we come to India. It is a very important Command, but has less independent initiative than any other of the Overseas Commands. The defence of the country is vested in the Army Commander-in-Chief, and the work of the R.A.F. is to assist the efforts of the Army, and sometimes to supplement them, in keeping the peace on the North-West Frontier. The units are organised as No. 1 (Indian) Group, which is divided into two Wings and one squadron held at the disposal of the Group. There is also one squadron of the Indian Air Force. The squadrons are described as either bomber squadrons or army co-operation squadrons, but all have to act on "general purpose" lines as occasion demands.

Finally there is the Far East Command with headquarters at Singapore, but it stretches out its tentacles to Hong Kong. As constituted before the war, it had squadrons of flying boats for overseas reconnaissance and torpedo-bomber squadrons for the defence of Singapore against naval attack. Singapore looks on to the sea, and so the Command is bound to have a naval character. It was a small Command, but is obviously intended to grow in size and importance.

AIRCRAFT of the R.A.F.

A Concise Pictorial and Factual Review of the Various Standard Types in Service

(Performance figures are improved in certain cases by the use of 100-octane fuel)

SPITFIRE.

Designing firm: Supermarine Aviation Works, Ltd.

Duties: Fighting.
Number of crew: One.
Construction: Metal.
Wing span: 36ft. 10in.
Power plant: Rolls-Royce Merlin.
Total max. h.p.: 1,030 at 16,250ft.
Gross weight: 5,900 lb.
Top speed: 367 m.p.h.
Armament: Eight machine guns.

HURRICANE.

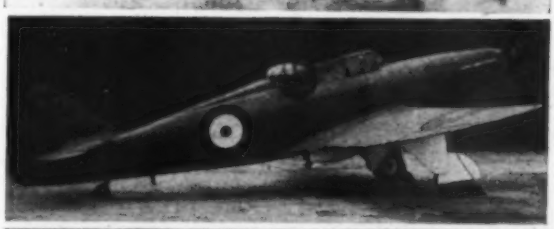
Designing firm: Hawker Aircraft, Ltd.

Duties: Fighting.
Number of crew: One.
Construction: Metal.
Wing span: 40ft.
Power plant: Rolls-Royce Merlin III.
Total max. h.p.: 1,030 at 16,250ft.
Gross weight: 6,360 lb.
Top speed: 335 m.p.h.
Armament: Eight machine guns.

DEFIANT.

Designing firm: Boulton Paul Aircraft, Ltd.

Duties: Fighting.
Number of crew: Two.
Construction: Metal.
Wing span: 39ft. 6in.
Power plant: Rolls-Royce Merlin.
Total max. h.p.: 1,030 at 16,250ft. (or more).
Armament: Four turreted guns.



BLENHEIM MK. I.

Designing firm: Bristol Aeroplane Co., Ltd.

Duties: Bombing, fighting, reconnaissance.
Number of crew: Three.
Construction: Metal.
Wing span: 56ft. 4in.
Power plant: Two Mercury VIII.
Total max. h.p.: 1,680 at 14,000ft.
Top speed: 285 m.p.h.
Armament: Machine guns and bombs.
Gross weight: 12,500 lb.

GLADIATOR.

Designing firm: Gloster Aircraft Co., Ltd.

Duties: Fighting.
Number of crew: One.
Construction: Metal.
Wing span: 32ft. 3in.
Power plant: Bristol Mercury IX.
Total max. h.p.: 840 at 14,000ft.
Gross weight: 4,750 lb.
Top speed: 250 m.p.h.
Armament: Four machine guns.

WHITLEY V.

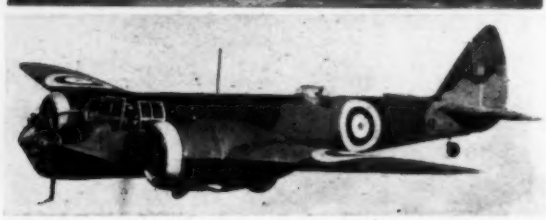
Designing firm: Sir W. G. Armstrong-Whitworth Aircraft, Ltd.

Duties: Bombing.
Number of crew: Five.
Construction: Metal.
Wing span: 84ft.
Power plant: Two Rolls-Royce Merlin.
Total h.p.: 2,000+
Top speed: 245 m.p.h.+
Armament: Five machine guns and bombs.

WELLINGTON.

Designing firm: Vickers-Armstrong, Ltd.

Duties: Bombing.
Number of crew: Four.
Construction: Metal.
Wing span: 86ft.
Power plant: Two Bristol Pegasus XVIII.
Total max. h.p.: 1,770 at 15,500ft.
Armament: Five machine guns and bombs.
Top speed: 265 m.p.h.
Gross weight: 24,850 lb.



HEREFORD.

Designing firm: Handley Page, Ltd.

Duties: Bombing.
Number of crew: Three-four.
Construction: Metal.
Wing span: 69ft. 2in.
Power plant: Two Napier Dagger.
Total max. h.p.: 2,000 at 8,750ft.
Armament: Machine guns and bombs.

HAMPDEN.

Designing firm: Handley Page, Ltd.

Duties: Bombing.
Number of crew: Three-four.
Construction: Metal.
Wing span: 69ft. 2in.
Power plant: Two Pegasus XVIII
Total max. h.p.: 1,770 at 15,500ft.
Gross weight: 18,756 lb.
Top speed: 265 m.p.h.
Armament: Six machine guns and bombs.

BEAUFORT.

Designing firm: Bristol Aeroplane Co., Ltd.

Duties: Bombing, reconnaissance.
Number of crew: Four.
Construction: Metal.
Wing span: 57ft. 10in.
Power plant: Two Bristol Taurus.
Armament: Several machine guns and torpedo or bombs.

BLENHEIM MK IV.

Designing firm: Bristol Aeroplane Co., Ltd.

Duties: Bombing and reconnaissance.
Number of crew: Three.
Construction: Metal.
Wing span: 56ft. 4in.
Power plant: Two Mercury XV.
Total max. h.p.: 1,680ft. at 15,000ft.
Top speed: 295 m.p.h.
Armament: Machine guns and bombs.
Gross weight: 14,400 lb.

BATTLE.

Designing firm: Fairey Aviation Co., Ltd.

Duties: Bombing, reconnaissance and training.
Number of crew: Two.
Construction: Metal.
Wing span: 54ft.
Power plant: Rolls-Royce Merlin II.
Total max. h.p.: 1,030 at 16,250ft.
Gross weight: 10,792 lb.
Top speed: 257 m.p.h.
Armament: Machine guns and bombs.

BOMBAY.

Designing firm: Bristol Aeroplane Co., Ltd.

Duties: Transport and bombing.
Number of crew: Three-four.
Construction: Metal.
Wing span: 95ft. 9in.
Power plant: Two Bristol Pegasus XXII.
Total max. h.p.: 1,780 at 6,500ft.
Top speed: 186 m.p.h.
Armament: Four machine guns.
Gross weight: 20,000 lb.

LYSANDER II.

Designing firm: Westland Aircraft, Ltd.

Duties: Army co-operation.
Number of crew: Two.
Construction: Metal.
Wing span: 50ft.
Power plant: Bristol Perseus XII.
Total max. h.p.: 905 at 6,500ft.
Gross weight: 6,015 lb.
Top speed: 230 m.p.h.
Armament: Three machine guns and bombs.

QUEEN BEE.

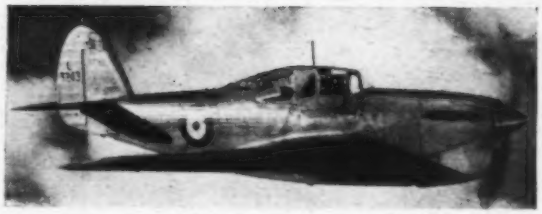
Designing firm: De Havilland Aircraft Co., Ltd.

Duties: Wireless-controlled target.
Number of crew: None.
Construction: Wood and metal.
Wing span: 29ft. 4in.
Power plant: De Havilland Gipsy Major.
Total max. h.p.: 130.

HENLEY.

Designing firm: Hawker Aircraft, Ltd.

Duties: Target towing.
Number of crew: Two.
Construction: Metal.
Wing span: 47ft. 10in.
Power plant: Rolls-Royce Merlin II.
Total max. h.p.: 1,030 at 16,250ft.
Top speed: 300 m.p.h.
Armament: None as target tower.
Gross weight: 9,050 lb.



FLAMINGO.

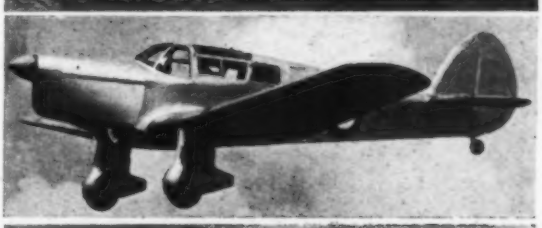
Designing firm: De Havilland Aircraft Co., Ltd.

Duties: Transport and communications.
Number of crew: Three.
Construction: Metal.
Wing span: 68ft.
Power plant: Two Bristol Perseus XVI.
Total max. h.p.: 1,610 at 6,000ft.
Gross weight: 17,600 lb.
Top speed: 239 m.p.h.

PROCTOR.

Designing firm: Percival Aircraft, Ltd.

Duties: Training and communications.
Number of crew: Three.
Construction: Wood.
Wing span: 39ft. 6in.
Power plant: D.H. Gipsy Queen II.
Total max. h.p.: 205.
Gross weight: 3,250 lb.
Top speed: 180 m.p.h.
Armament: None.



D.H.86b.

Designing firm: De Havilland Aircraft Co., Ltd.

Duties: Communications and training.
Number of crew: Two.
Construction: Wood.
Wing span: 64ft. 6in.
Power plant: Four Gipsy Six I.
Total max. h.p.: 800.
Gross weight: 10,250 lb.
Top speed: 166 m.p.h.

MASTER.

Designing firm: Phillips and Powis Aircraft, Ltd.

Duties: Advanced training.
Number of crew: Two.
Construction: Wood.
Wing span: 39ft.
Power plant: Rolls-Royce Kestrel XXX.
Total max. h.p.: 600 at 14,250ft.
Top speed: 268 m.p.h.
Armament: 1-2 machine guns and bombs.

OXFORD.

Designing firm: Airspeed (1934), Ltd.

Duties: Advanced training.
Number of crew: Three.
Construction: Wood.
Wing span: 53ft. 4in.
Power plant: Two Armstrong Siddley Cheetah X
Total max. h.p.: 710 at 7,000ft.
Gross weight: 7,500 lb.
Top speed: 197 m.p.h.
Armament: One machine gun and bombs.

HARVARD.

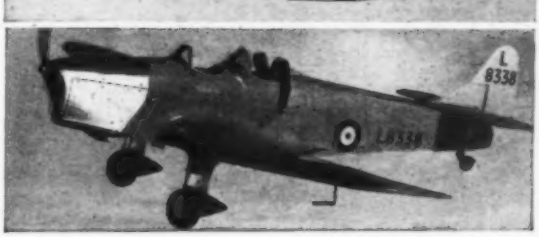
Designing firm: North American Aircraft, Inc.

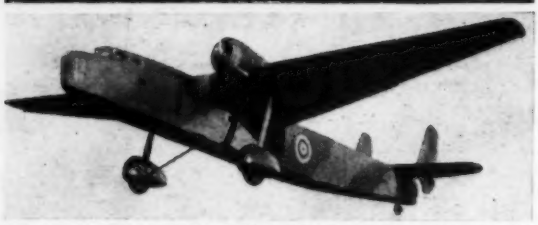
Duties: Advanced training.
Number of crew: Two.
Construction: Metal.
Wing span: 42ft.
Power plant: Pratt and Whitney Wasp H.
Total max. h.p.: 550 at 8,000ft.
Gross weight: 5,130 lb.
Top speed: 210 m.p.h.
Armament: 1-2 machine guns.

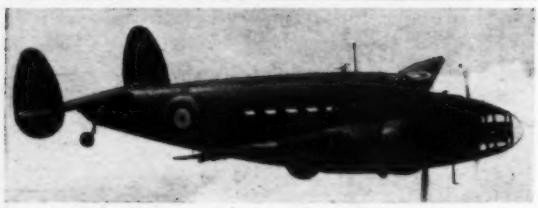
MAGISTER.

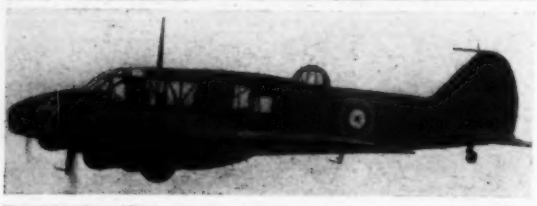
Designing firm: Phillips and Powis Aircraft, Ltd.

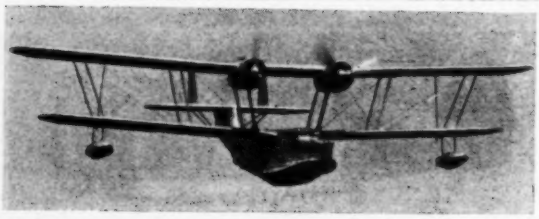
Duties: Training.
Number of crew: Two.
Construction: Wood.
Wing span: 33ft. 10in.
Power plant: D.H. Gipsy Major.
Total max. h.p.: 130.
Gross weight: 1,825 lb.
Top speed: 145 m.p.h.











TIGER MOTH.

Designing firm: De Havilland Aircraft Co., Ltd.

Duties: Training.
Number of crew: Two.
Construction: Wood and metal.
Wing span: 29ft. 4in.
Power plant: D.H. Gipsy Major.
Total max. h.p.: 130.
Gross weight: 1,825 lb.
Top speed: 109 m.p.h.

HARROW II.

Designing firm: Handley Page, Ltd.

Duties: Training.
Number of crew: Four-five.
Construction: Metal.
Wing span: 88ft. 5in.
Power plant: Two Bristol Pegasus XX.
Total max. h.p.: 1,850 at 10,000ft.
Gross weight: 23,500 lb.
Top speed: 200 m.p.h.
Armament: Five machine guns and bombs.

HUDSON.

Designing firm: Lockheed Aircraft Corporation.

Duties: Reconnaissance and bombing.
Number of crew: Three-four.
Construction: Metal.
Wing span: 65ft. 6in.
Power plant: Two Wright Cyclone G.
Total max. h.p.: 1,700 at 6,000ft.
Armament: Several machine guns and bombs.

ANSON.

Designing firm: A. V. Roe and Co., Ltd.

Duties: Reconnaissance and training.
Number of crew: Three.
Construction: Wood and metal.
Wing span: 56ft. 6in.
Power plant: Two Armstrong Siddeley Cheetah IX.
Total max. h.p.: 700 at 7,300ft.
Gross weight: 10,792 lb.
Top speed: 188 m.p.h.
Armament: Two machine guns and bombs.

SUNDERLAND.

Designing firm: Short Bros., Ltd.

Duties: Reconnaissance and bombing.
Number of crew: Six-eight.
Construction: Metal.
Wing span: 112ft. 9½in.
Power plant: Four Bristol Pegasus XXII.
Total max. h.p.: 3,560 at 6,500ft.
Gross weight: 44,600 lb.
Top speed: 210 m.p.h.
Armament: Seven machine guns and bombs.

LERWICK.

Designing firm: Saunders Roe, Ltd.

Duties: Reconnaissance and bombing.
Construction: Metal.
Wing span: 81ft.
Power plant: Two Bristol Hercules.
Total max. h.p.: 2,750 at 4,000ft.
Armament: Several machine guns.

STRANRAER.

Designing firm: Supermarine Aviation Works, Ltd.

Duties: Reconnaissance and bombing.
Number of crew: Five.
Construction: Metal.
Wing span: 85ft.
Power plant: Two Bristol Pegasus X.
Total max. h.p.: 1,830 at 6,250ft.
Gross weight: 19,000 lb.
Top speed: 165 m.p.h.
Armament: Three machine guns and bombs.

LONDON.

Designing firm: Saunders Roe, Ltd.

Duties: Reconnaissance and bombing.
Number of crew: Five-six.
Construction: Metal.
Wing span: 80ft.
Power plant: Two Bristol Pegasus X.
Total max. h.p.: 1,830 at 6,250ft.
Gross weight: 18,400 lb.
Top speed: 155 m.p.h.
Armament: Three machine guns and bombs.

INITIAL FLYING TRAINING

What to Expect While Learning to Fly : Pupils in the R.A.F.

IF the number of applications received at R.A.F. recruiting offices from would-be R.A.F. pilots can be taken as an indication, there would seem to be no falling off of glamour so far as flying is concerned. At the moment there are thousands of young men undergoing initial training or hoping to be among the next batch to go to one of the E.F.T.S.s dotted all over the country. We are practically mass-producing pilots for the first time in our history. In the last war a man became a pilot by grit and a good modicum of luck which gave him time to complete his flying training while on actual service. This time a pilot who has passed through elementary, intermediate and advanced schools—every R.A.F. pilot must do this—and has sampled squadron work, can call himself experienced and ready to meet the enemy on rather better than even terms.

It has been said many times, and truthfully, that a pilot is made or otherwise in his first 50 hours. During that critical period his mental attitude as well as his ability for flying are created. It is unlikely that anyone who is unsuitable for active service will get past the elementary stage. Every opportunity is, however, given to each pupil. If he is slow to learn or unable to reach solo standard in normal time, then a change of instructor may help. It is usually easy to decide at an early stage whether the temperament of either pupil or instructor is the cause of retarded progress, or if a pupil is one who will never make a pilot. Should the measure mentioned above fail to produce an improvement in a pupil's flying, a final test by an instructor chosen for his special ability and experience will decide the future of the pupil. He may either be suspended or given a further period to make good.

"Flight" photograph.

. . . young men undergoing initial training or hoping to be among the next batch.

"Flight" photograph

. . . should have learnt to execute all normal flying manœuvres in a light training aeroplane.

Flying is not the simple matter it used to be for several reasons which need no more than a mention. The vastly improved performance and the complexity of the modern Service aircraft are the main factors to contend with. From the word "go," ground instruction is a branch of training at least as important as the actual flying. What use would a man be who could cope with the controls of most aeroplanes but was quite unable to solve the attendant problems of navigation, interception, or gunnery? To make the best use of a modern aircraft the pilot must understand its structure and principle, and the like.

Under the present R.A.F. training schemes, flying and ground training must advance side by side. Pupils may be, and often are, rejected from both for failure in one. The sooner an unsuitable "pilot" is turned over to some other branch of national service for which he has more ability, the less money and time is wasted. The cost to the country of even initial flying training can be reckoned at well over £5 per pilot/hour. Advanced training must cost more than twice this figure.

The First Stage

The normal course of events for an R.A.F. recruit who has passed the Medical Board and been accepted is to commence as soon as possible on an initial period of 50 hours' flying and the parallel ground training. In 50 hours (of reasonably hard work) in the air a pupil pilot should have learnt to execute all normal flying manœuvres in a light training aeroplane. The types in general use at present are the D.H. Gipsy Tiger Moth (biplane) with 130 h.p. Gipsy Major engine and the Miles Magister (monoplane) with similar engine. Augmenting these are a few Blackburn B.2 trainers with Cirrus or Gipsy engines, some Avro Cadets with 140 h.p. Armstrong Siddeley Genet Major engines, and the rather larger Avro Tutors with

INITIAL FLYING TRAINING (CONTINUED)

215-240 h.p. Armstrong Siddeley Lynx radial engines. These last-named types are, of course, biplanes.

It may appear strange that pupils are trained for the most part on biplanes when, with very few exceptions, the R.A.F. is equipped with monoplanes. There will no doubt always be some controversy about this subject. However, we may assume that this matter has not in practice proved worth the name of problem. It is true that many pilots of not more than 250 hours' experience on biplanes of, say, Tiger and Hawker Hart types, took safely to Spitfires and Hurricanes after about two hours' conversion on Magisters or Battles. Many hours are necessary before such a pilot could truthfully claim himself to be thoroughly conversant with our modern fighters. A large number of V.R.s found themselves last September in such a position.

Plenty to Learn

Biplane versus monoplane of more modern conception is again brought to mind if one consults the latest C.F.S. instruction patter. Sentences referring to flaps and brakes have no application to a Tiger Moth, which is not equipped with either. On the whole, pupils have plenty to occupy their minds during their first 50 hours in the air, and it may reasonably be argued that instruction in the use of flaps can well be left until a later stage. To a pupil who specifically asks about flaps, v.p. airscrews, and the like, a chat on the ground is probably the best course because an attempt in the air to explain or demonstrate the possible effects of these devices on a Tiger Moth would most probably prove very confusing to a pupil.

During the 50 hours initial flying allotted to a pupil he must complete five hours under the hood (flying by instruments only), five hours navigation, included in a solo cross-country flight, and at least 25 hours of the whole must be dual. The usual proportion seems to be 28-30 hours dual and 20-22 solo. This flying and the ground training corresponding with it are completed in eight to twelve weeks, depending upon the time of the year. The sequence of instruction and the exercises learnt are as follows:—

1. Air experience.
1a. Familiarity with cockpit layout.
2. Effect of controls.
3. Taxi-ing.
4. Straight and level flight.
5. Climbing, gliding and stalling.
6. Medium turns.
7. Taking off into wind.
8. Powered approach and landing.
9. Gliding approach and landing.
10. Spinning.
11. First solo.
12. Side-slipping.
13. Precautionary landings.
14. Low flying (with instructor only).
15. Steep turns.
16. Climbing turns.
17. Forced landings.
18. Action in event of fire.
18a. Abandoning aircraft.
19. Instrument flying.
20. Taking off and landing out of wind.
21. Restarting engine in flight.
22. Aerobatics.

Most pupils get off solo between eight and ten hours, but those who take twelve have no need to worry.

Flying and ground instruction occupy roughly half the working day each. At this time of the year a pupil who flies during a period, say, 8.30 to 10 a.m., will attend ground lectures between 10.30 a.m. and 12 mid-day, a break between sections being allowed. Half the course, or one of the courses if there are two, keeps to these times, while the others have lectures first, then flying. Similar 90-minute periods are observed in the afternoon. The actual flying periods may be devoted to a short dual and solo flight or, say, a longer dual period in the morning followed by solo in the afternoon. In any case, a pupil has regular dual trips between solo, the longest time for solo without dual being 2½ hours (in one or several flights).

A pupil's main object during his eight-twelve weeks under training is to satisfy the examiners in ground subjects and prepare for the various flying tests after about 50 hours. For success in these tests one must make sure above all of accurate flying. The C.F.I., who generally does quite a lot of the testing, must help to keep the instructors in close touch with current practice as dictated by C.F.S.

A pupil who does not climb and glide at the correct speed or who uses too much or too little throttle for his steep or climbing turns has only himself to blame. These speeds will have been drilled into him quite enough in 50 hours, and failure to observe them is simply a case of slack flying. It is the instructor's job to see that he has plenty of practice in keeping his turns steady, maintaining the aircraft's nose in a correct position with relation to the horizon and so on. All these are the simpler points.

Because the monoplane types in which a pupil will eventually find himself have relatively high wing loading, it has recently been the practice to spend more time on approaches to landings with engine (rumble landings) as opposed to the glide approach, which was at one time in regular use. A pupil still makes a large number of glide approaches to improve his judgment and help in making forced landings, but must also have regular practice in the engine approach.

The old technique for forced landing approaches ("S" turns on the downwind side of the field) is not altogether applicable to modern types. One learns this method on training types, but the important point which is stressed is to manœuvre the aeroplane into such a position down wind of the chosen field that a last turn across wind is made at about 1,000ft. and a final medium turn into wind at about 500ft. The distance from the field depends, of course, upon the strength of the wind. On a Tiger side-slipping is used to absorb excess height where flaps and straight glide might be used on, say, a Battle.

Spinning

A lot has been said about spinning during the past year, particularly by the non-flying public who can hardly know what it is all about. One of the early lessons in flying is in how to recover from a spin (having purposely got into it). From the safety point of view, which is most important in a trainer, the Tiger Moth, representative of biplane trainers, is ideal in this respect. A Tiger will, in fact, recover from a spin unaided—certainly it is sufficient on all occasions to centralise controls. This method is not, however, suitable for getting the majority of monoplanes out of a spin. It is essential, if the practice is to be valuable, at least to hold on sharply *full* opposite rudder and *then* ease the control column well forward to dive the aeroplane to full flying speed. This practice seems rather to trouble pupils, and only with the greatest difficulty can they be persuaded to put on more rudder than is required for recovery on the Tiger. Spinning is considered important enough to be a compulsory practice each week, and is the only manœuvre outside straightforward flying which is taught previous to a first solo. Later at a Service F.T.S. pupils are taught other or extra movements to facilitate recovery from spins. These include the use of throttle.

Aerobatics constitute another important part of training and are taught at an early stage. Their use is twofold. (1) They help a pupil to have confidence and full control of his machine whichever way up he may find himself. (2) They are most important for aerial combat. Great, perhaps too great, importance can be attached to slow rolls which are the least important manœuvre from the practical point of view. Though giving good practice in the use of controls and looking pretty when well executed, they are worthless in combat.

INITIAL FLYING TRAINING (CONTINUED)

. . . most pupils get off solo between eight and ten hours but those who take twelve have no need to worry.

"Flight" photograph.

Precautionary landings are a fairly new arrival in the syllabus, and are used as the name suggests when weather or loss of position makes a landing advisable or necessary. Unlike forced landings, however, the pilot has engine(s) to help him and sufficient petrol to find a really suitable field in which to land. The practice is in how best to find and prove your field, and how to make a safe approach and landing with engine, at a minimum safe speed (to reduce landing run). This entails at least one "dummy run."

Instrument Flying

One of the biggest changes in early training during the last year or two is the concentration on instrument flying. The standard of blind flying has been raised considerably, thanks partly to the Link Trainer which is now to be found at least singly and often severally at all R.A.F. stations. A definite Link syllabus is carried out at the same time as ground and flying training. As aeroplanes improve and radio methods of aerodrome control advance, the use of instrument flying will, of course, extend even beyond its present stage. Already it is possible to fly in almost any weather, and but for the need to preserve a good name and avoid all undue risks, airlines could operate an unbroken schedule for the full twelve months of every year. In bad weather this would entail flying blind most of the time. The Link Trainer can be used for almost all blind flying practices, including Lorenz approaches (and landings). There would, however, seem to be only very limited use for a "Visual Link" as an aid to control of an aeroplane in the early stages of instruction.

Conditions of entry of pilots into the R.A.F. are similar to those for air crews generally. Pilots, observers, wireless operators and air gunners are all drawn from recruits who enlist in the first instance for training as "aircraft crew." They must pass a special medical examination, and must be adjudged as suitable by a selection board.

The age limits for enlistment are 18 to 28 for airman pilots and 18 to 32 for other members of the air crew. When he enlists a man may state his preference for the job of pilot, observer or other of the air crew trades. Those unsuitable for enlistment as members of air crews may be given an opportunity to remuster for ground duties.

All recruits are enlisted for the duration of the war.

Recruits selected as suitable for air crews are first mustered as Aircraftmen 2nd Class with pay at the rate of 2s. a day during training. Pilots are then remustered and reclassified as Leading Aircraftmen and paid at the rate of 5s. a day plus flying instructional pay at the rate of 2s. a day.

Air observers under training are also remustered as L.A/C. and paid 5s. a day plus flying instructional pay at the rate of 1s. 6d. during training. Other members of air crews remain A.C.2s during training with pay remaining at 2s. a day.

When their training is complete airmen are remustered and reclassified or promoted according to the percentage of marks they obtain on passing out of training.

An airman pilot becomes a sergeant with pay at the rate of 12s. 6d. a day. An observer may be either a sergeant or an acting sergeant. If the latter, he receives pay at the rate of 9s. a day.

A wireless operator may be classified on completing training as a L.A/C., an A.C.1 or an A.C.2 with pay at the rate of 5s., 4s. 3d. or 3s. 6d. a day respectively, plus air crew pay and air gunner pay of 1s. 6d. a day.

An air gunner is classified in the same way but receives pay of 4s., 3s. 6d. or 2s. a day, plus the air crew and air gunner pay of 1s. 6d. a day.

In all instances pay is for a seven-day week.

A certain number of airman pilots and observers are selected for commissions on the results they obtain in the examination at the conclusion of their training.

The wives of married airmen are paid a family allowance varying from 17s. to 23s. 6d. a week according to rank with additional allowances for children.

At the same time airmen receive free accommodation, food and clothing (or money allowances instead) and medical attendance.

"Flight" photograph.

. . . where flaps and straight glide might be used on, say, a Battle.

SERVICE AVIATION

Hawker Hurricane 8-gun fighters taking up echelon formation not far behind the Maginot line.

Royal Air Force *Official Announcements*

Middle East Command

AIR Chief Marshal Sir Arthur M. Longmore is to succeed Air Chief Marshal Sir William Mitchell as Air Officer Commanding-in-Chief, R.A.F., Middle East, with effect from May 20.

Casualties

THE Air Ministry regrets to announce the following casualties on various dates:—

KILLED IN ACTION.—A/C.1 D. Burnside; Sgt. R. F. Carter; Sgt. W. Cuthbert; F/O. H. G. Graham-Hogg; Sgt. J. R. Proctor; A/C.1 J. Shuttleworth; Sgt. J. Windsor.

KILLED IN ACTION, PREVIOUSLY REPORTED "MISSING."—L.A/C. E. W. J. Picot.

PRESUMED KILLED IN ACTION, PREVIOUSLY REPORTED "MISSING, BELIEVED KILLED."—A/C.2 W. H. Fiddock.

PRESUMED KILLED IN ACTION," PREVIOUSLY REPORTED "MISSING."—Sgt. R. A. Bigger; Sgt. G. J. Burrell; A/C.1 T. Fullerton; A/C.1 A. F. Hill; A/C.1 A. B. Macdonald; A/C.1 J. A. Topham; P/O. P. E. W. Walker.

WOUNDED OR INJURED IN ACTION.—Sgt. C. N. S. Campbell; F/O. P. Walker; Sgt. G. Whitlam.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—P/O. A. E. Evans; F/O. P. F. Templeman.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. E. R. Clarke; L.A/C. J. H. Edwards; Sgt. G. C. Perry; F/O. K. R. H. Sylvester.

MISSING.—A/C.1 A. Bailey; Sgt. V. H. Barr; Sgt. R. H. J. Battrick; L.A/C. E. Beynon; Flt. Sgt. J. W. L. G. Brent; L.A/C. A. R. S. Brown; Sgt. P. C. Cunningham; Sgt. E. Davison; L.A/C. T. Dobson; A/C.1 E. B. Doherty; A./Sqn. Ldr. K. C. Doran, D.F.C.; Sgt. D. W. Edmunds, A.F.M.; P/O. H. C. F. Fenton; Sgt. G. E. Goad; L.A/C. A. J. P. Golder; Sgt. T. Gosling; Sgt. N. J. Griffin; Sgt. N. Haithwaite; A/C.1 F. Hargreaves; A/C.1 F. Harwood; Sgt. J. L. Hawken, D.F.M.; Sgt. J. F. Hayes; A/C.2 J. Henry; L.A/C. T. Hogarth; L.A/C. N. Hornsby; F/O. O. G. Horrigan; P/O. R. F. Hoskins; Sgt. P. J. Hurst; Sgt. A. F. James; Sgt. N. L. Jones; Cpl. J. H. Langridge, R.N.Z.A.F.; A/C.1 T. W. Lerway; A/C.1 D. Lilley; Sgt. S. McCrossan; F/O. H. G. Muller; L.A/C. A. Murcar, D.F.M.; A/C.1 E. G. Newby; P/O. L. G. Nolan-Neylan; A/C.1 M. J. O'Sullivan; Sgt. E. W. A. Peachey; F/O. T. V. Poltock; P/O. G. A. H. Poole; F/O. D. P. W. R. Robinson; P/O. R. H. Sanders; P/O. F. M. N. Searle; A/C.1 R. J. Simpson; Sgt. R. F. Vickery; A./Flt. Lt. P. E. Warne; P/O. C. A. Weeks; F/O. D. White; A/C.2 C. C. Whitley; Sgt. F. A. Woodcock.

KILLED ON ACTIVE SERVICE.—P/O. A. L. V. Barnes; P/O. M. E. F. Barnett; Sgt. C. A. L. Bevan; Sgt. G. Chapman; Sgt. N. R. Davidson; Sgt. G. L. Dent; P/O. L. S. Dixon; P/O. P. de G. Fry; P/O. C. D. Gordon-Wilson; Sgt. D. A. Hampton; Sgt. T. G. Horsfield; A/C.2 J. W. Kempton; A/C.1 G. Lindsay; A/C.2 A. C. Lucas; Sgt. I. N. Murdoch; Sgt. P. W. Roberson; Sgt. B. J. Spencer; Sgt. R. E. Wilson.

PRESUMED KILLED ON ACTIVE SERVICE, PREVIOUSLY REPORTED "MISSING, BELIEVED KILLED."—P/O. J. W. Boreham.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.2 E. A. Coates; Sgt. A. J. Kenny; P/O. R. E. Orchard; F/O. J. D. Tucker.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—A/C.2 L. F. Foster; A/C.2 C. Parkin.

DIED OF INJURIES RECEIVED ON ACTIVE SERVICE, PREVIOUSLY REPORTED INJURED.—L.A/C. G. W. D. Carter.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—L.A/C. K. J. Cyster; L.A/C. G. W. Patterson; Sgt. K. P. Vickery; P/O. D. R. Williams.

DIED ON ACTIVE SERVICE.—A./Sqn. Ldr. B. C. Adamson; Cpl. J. McK. Chivering; A/C.2 L. W. Elliott; A/C.2 W. G. A. Hoyland; A/C.2 W. Kellett; L.A/C. W. R. C. Knights; A/C.1 A. C. Lerigo; A/C.2 S. K. Little; A/C.1 H. E. Pugh; A/C.1 J. Read; P/O. C. R. Smith; A/C.2 J. W. Wells.

Awards

THE King has been graciously pleased to approve of the undermentioned awards in recognition of gallantry displayed in flying operations against the enemy:—

BAR TO DISTINGUISHED SERVICE ORDER

EMBRY, WING COMMANDER BASIL EDWARD, D.S.O., A.F.C.

In one of the R.A.F. raids on Stavanger aerodrome Wing Cdr. Embry led a squadron of aircraft in an attack on the aerodrome and seaplane base. He successfully completed his task and brought the whole squadron home safely, despite the failure of one of his engines before he had reached the objective. Two days later he led his squadron in another successful attack on Stavanger when valuable photographs were taken. During this flight he suffered from frostbite. The satisfactory results from these operations were primarily due to the courage, determination and fine leadership of this officer.

DISTINGUISHED FLYING CROSS

EDWARDS, FLYING OFFICER WILLIAM HENRY.

F./O. Edwards was pilot of one of a number of R.A.F. aircraft that left to attack Stavanger aerodrome and seaplane base early in April. The weather was so bad that the other aircraft were compelled to abandon the task, but F./O. Edwards succeeded in getting through, attacked the objectives and obtained valuable information. On the previous day he was pilot of one of a number of aircraft ordered to attack the same objectives. Despite a heavy

snowstorm, which forced him to fly very low, he reached the target and attacked in the face of heavy anti-aircraft fire. When returning he attacked a Dornier seaplane with his guns and scored hits. On both days this officer displayed great skill and determination and courage of a high order.

TOWNSEND, FLIGHT LIEUTENANT PETER WOOLDRIDGE.

Whilst on patrol over the North Sea, Flt. Lt. Townsend intercepted and attacked an enemy aircraft at dusk, and, after a running fight, he shot it down. This was his third success, and in each instance he displayed qualities of leadership, skill and determination of the highest order, with little regard for his own safety.

Unit Badges

HIS MAJESTY THE KING has graciously approved the badge and motto for Headquarters, No. 11 Group, and they may now be taken into use. Badge—The Clock Tower of the Houses of Parliament enfiled with an astral crown. Motto—Tutela Cordis.

Empire Societies War Hospitality Committee

THE Empire Societies War Hospitality Committee, the joint committee of all the non-political Empire societies, has made extensive arrangements covering London and other parts of the country to welcome and help officers and men from the dominions, India and the Colonies, when on leave.

The following are clubs under the committee's auspices, where information can be obtained and through which entertainment and hospitality can be arranged:—

London.—Royal Empire Society, Northumberland Avenue, London, W.C.2; *for officers.* Charges: Bed and breakfast 7s. 6d.

London House, Guilford Street, London, W.C.1; *for officers.* Charges: 6s. 6d. for bed, breakfast and either lunch or dinner.

Overseas League, Over-Seas House, St. James's, London, S.W.1; *for all ranks.* Charges: Bed and breakfast 7s. 6d.

The King George and Queen Elizabeth Victoria League Club, Malet Street, London, W.C.1; *for airmen.* Charges: From 2s. 6d. for bed and breakfast.

Oxford.—The King George and Queen Elizabeth Victoria League Club, 21, George Street, Oxford (opposite New Theatre). Non-residential. Canteen, reading, writing and recreation rooms.

Edinburgh.—The King George and Queen Elizabeth Club, 100, Prince's Street, Edinburgh; *for officers.* Charges: Bed 5s. Breakfast 1s. 6d.

The King George and Queen Elizabeth Victoria League Club, 121A, Prince's Street, Edinburgh; *for airmen.* Charges: Bed 1s. Breakfast 1s. 3d.

Glasgow.—Arrangements are being made for a club centre in Glasgow. Particulars of developments in Glasgow and other Scottish centres are obtainable from the Edinburgh clubs or from J. Roger Orr, Esq., W.S., Honorary Secretary, Empire Societies War Hospitality Committee, Scottish Branch, 18, Heriot Row, Edinburgh (Telephone No. Edinburgh 24151).

Belfast.—Ulster Branch Headquarters of the Overseas League, 25, Donegall Place, Belfast (Telephone No. Belfast 20861). Non-residential. Reading, writing and recreation facilities.

The Empire Rendezvous and Information Bureau, at 18, Northumberland Avenue, London, W.C.2 (off Trafalgar Square), is open daily, including Sundays, for reading, writing, recreation and light refreshments. It is the Central Information Bureau, where information is obtainable on all subjects, including especially accommodation, sightseeing, entertainments and personal hospitality. Introductions are given to societies, clubs and other groups and individuals in all parts of the country. Inquiries can be made by letter, personal call or telephone (Whitehall 6733).

Air Ministry Appointment

AS we go to press we learn that a reorganisation of the Training and Reserve Commands is to take place. In future there will be a Flying Training Command under (acting) Air Marshal L. A. Pattinson, C.B., D.S.O., M.C., D.F.C., which will absorb the former Reserve Command, and a Technical Training Command under (acting) Air Marshal W. L. Welsh, C.B., D.S.C., A.F.C.

GERMAN RECONNAISSANCE AIRCRAFT

The floatplane shown being launched is a Heinkel He 114 shipboard reconnaissance machine with a B.M.W. 132 engine. It is believed to have given place largely to a newer type of Arado monoplane with a similar power plant.

Below is the version of the Dornier Do 17 which is most commonly used for reconnaissance by the *Luftwaffe*. This has two B.M.W. 132 radials and carries one large and two medium-sized cameras. It is also used as a bomber but is not considered as a twin-engined fighter.

AN ENGINEER IN SEARCH OF TRUTH

The New Laboratories of High Duty Alloys : Research Pays Handsome Dividends

The corrosion and protection laboratory. Immersion tests are proceeding on the left.

OFFICIALLY opened on April 30 by Sir Henry Tizard, K.C.B., F.R.S., F.R.Ae.S., chairman of the Aeronautical Research Committee, the new research laboratories of High Duty Alloys are a model of what such an establishment should be. The work was started about a year ago, and, in welcoming his guests, Mr. W. C. Devereux recalled that when the High Duty Alloys works were founded in 1927 there were five people in the laboratory and seven in the works. Although the ratio was somewhat smaller now (about 15 per cent.), he had always believed in the value of research.

The cost of the new laboratories has been defrayed entirely by the company, and in commenting on this fact Mr. Devereux said that no other country penalised research so much as our own, and it provided no relief of taxation for expenditure carried out by industrial undertakings. He suggested that if our Government turned to well-directed and controlled research, then for every £100,000 spent many millions would be saved.

The new laboratories, Mr. Devereux said, were closely associated with works production through the routine testing departments. He encouraged research workers to give advice on works administration and policy, believing that contact with the administration was desirable, since the passage of technical information through non-technical channels was a very dangerous practice.

Sir Henry Tizard, in declaring the new laboratories open, commented on the excellence of the equipment and the pleasant and comfortable surroundings in which the laboratory workers lived. What he had seen there that day would make the mouths of Government research workers water. He also commented on the fact that the laboratories were built and equipped in a year. That would be unthinkable in the case of a Government laboratory.

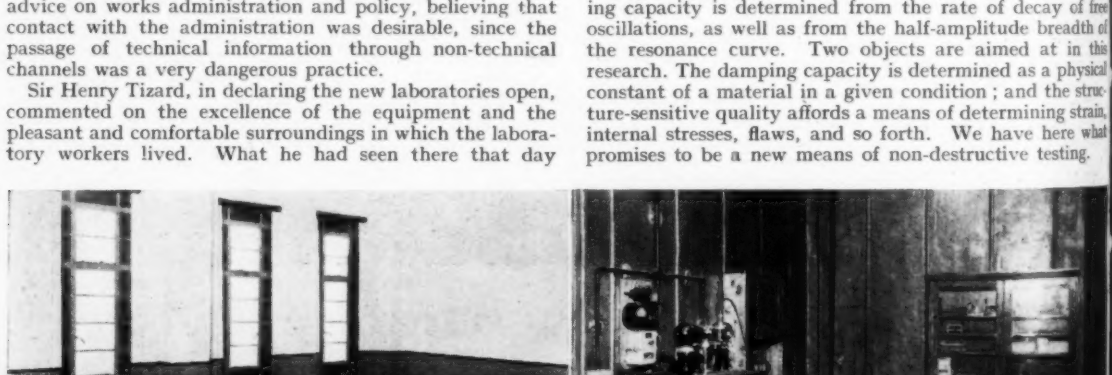
Sir Henry recalled that many years ago he had tried to sum up the position of research, and at that time had come to the conclusion that theory by itself was very far from accounting for all the phenomena encountered, and that research and experiment, often of an impirical nature, was necessary, and would remain so for many years to come. He still held that view, although theory had made some progress during the intervening years.

All-embracing

Covering a floor area of 45,000 sq. ft., the new laboratory buildings house departments which specialise in every conceivable branch of research on metals. In the spectrographic department routine analysis of the aluminium alloys produced by the company is carried out. There is a laboratory for testing corrosion properties and protective treatments; an X-ray crystallographic laboratory; a colorimetric laboratory; a metallographical laboratory; and a radiographic laboratory. In this latter, castings travel past a screening table on a conveyor belt. Any casting which shows a defect is sprayed with a die for identification when it has left the conveyor.

In addition to the special laboratories mentioned, there are, of course, chemical and mechanical testing laboratories, and experimental heat-treatment departments, rolling mill and an experimental foundry.

Personally, we were most intrigued by the new damping laboratory. In this, investigations are carried out by means of electro-acoustic apparatus of the damping capacity of test specimens and manufactured components. The damping capacity is determined from the rate of decay of free oscillations, as well as from the half-amplitude breadth of the resonance curve. Two objects are aimed at in this research. The damping capacity is determined as a physical constant of a material in a given condition; and the structure-sensitive quality affords a means of determining strain, internal stresses, flaws, and so forth. We have here what promises to be a new means of non-destructive testing.



In the spectrographic laboratory (left) routine analysis of alloys is carried out. On the right is a portion of the X-ray crystallographic laboratory.

COMMERCIAL AVIATION

"A. Viator" on the Importance of the Atlantic Route : To Hollywood in 3½ Days : May Day and Casting a Clout : Hunting the Clipper

THE powers that guide the destinies of civil aviation in this country seem to delight in dealing it blow after knock-out blow. There are to be no British services across the Atlantic this year because there are no flying boats to spare, these having been collared for military service. Now that is all very well, but in a well-organised war the troops have their own lorries, and it is not found necessary to deprive the public of buses along vitally important routes. [What about Green Line coaches?—ED.]

What route could be more important than the Transatlantic hop, and what could be more depressing for Airways Corporation, whose whole organisation, pilots, crews, ground staff and so on, is ready and waiting? Commercially, too, it is a disaster to leave the whole thing to the progressive and enterprising Americans, and in my humble view it is all extremely unnecessary.

Everybody, except the Directorate of Civil Aviation seemingly, has been aware for a considerable number of years that there was pretty sure to be a war, and there should now be no shortage of boats for essential routes, for these should have been earmarked long ago by a Directorate of Civil Aviation, strong enough and determined enough to say to the Brass Hats: "Hands off civil aviation, which is economically important to the nation." I am fairly certain they would have had the support of those Ministries concerned with spreading propaganda (if any) and with Economic Warfare.

A Good Beginning

There seems to be no definite Airways Corporation move from Heston to Gatwick yet, though I understand an advance landing party consisting of the Catering Dept. of A.C. was seen there some short while back, presumably testing the specific gravity of the local beer, a question quite definitely and specifically of great gravity. When I last passed Gatwick in the train a couple of crows were gravely examining the landing surface and there was no other sign of life. They were pecking at the place in a dissatisfied manner, very like Government Inspectors and just as pompous.

I hear that the A.C. London-Lisbon service will not start until the company is installed at Gatwick. That is a pity, for May 4 was, I believe, announced fairly firmly for the opening of this service.

K.L.M. is now carrying passengers to and from Lisbon regularly, and I hear that passenger bookings are good. Some ingenious guy has arrived at the conclusion that if you happen to need a Hollywood film star over here in England, for one thing or another, it is easy by the combined Dutch and American lines concerned.

Going the other way, in case Mahomet will not come to the mountain, you can leave London at 4.30 p.m. by K.L.M., sleep in Amsterdam, leave next morning and arrive in Lisbon around tea-time ; embark 8 a.m. next day by Pan-American Clipper, arrive New York noon next day, spend five hours there, then away by T.W.A. Skysleeper for Los Angeles, three-and-a-half days in all.

Once in Hollywood you take a cab and call on Miss Garbo, who sends out a message that she wants to be al-o-one and the butler heaves you on to the sidewalk, but it does show what modern science is capable of, does not it? The first through-passenger (not a film star by the way) arrived in England from New York by this line on May 6.

Despite the ancient adage about not casting a clout (Anglo-Saxon ; heavynge a halfe brykke) until May is out, we British have an unconquerable conviction that topical weather starts on May 1 with the advent of the first snow bunting and the earliest icepecker.

Government departments cut off the hot pipes with gusto and a spanner, for example, even though the scene may be one of Arctic desolation, and when we were their tenants, serfs, or villeins at Croydon, all you got from the steam heating system on or after May Day was a sinister hiss and a couple of mocking gurgles, and much the same answer was obtained on the 'phone when ringing Dept. Dir. Hot Air and Letting Off Steam.

One bitter spring I visited this elegant functionary in his resplendent office in Whitehall to complain, but he was able to demonstrate that his own hot pipes were turned off. He then commenced to outline the views of His Majesty's Government on the matter, but most of his remarks were drowned by an office messenger with half a hundredweight of coals, which he poured on to an immense fire, the bars of which were already white hot and the chimney on fire.

Officially it was nice and warm at Croydon that year, but icicles hung from all our ears and a snowdrift impeded our passage to the bar. In that drift an eminent member of the community (now an enemy alien) became semi-permanently upended, exhibiting only the soles of his feet garnished with rubber heels bearing the legend "Rumramph's (foreign made) rubbers make you walk on air," which was exactly what the guy seemed to be doing, his feet going feebly through the motion of a short country stroll of an inverted nature. Then one who knew him well said he was semaphoring for a double, and the Scottish mixture was administered through a tube regularly until the thaw.

Then again there is that business of turning out on May 1 in snow-white cap covers which all air transport people do in order to avoid being bowled over by the sunstroke epidemic which attacks black homburg hats from May Day onwards. Foreign air line people argue that the function of the white cap cover is to protect the head from heat, and not to form a basis for miniature snowdrifts as one walks about the tarmac in "Joly, joly springe."

Playing the Game

It might be a good thing, nevertheless, if certain Civil Servants were issued with panamas or boaters on May 1, for they certainly seem to go queer at this time of year, possibly due to ultra-violent rays piercing their black hats. They are addicted to all manner of May games at this time, such as Blind Man's Bluff (I don't see the point of yours of the umpteenth ult.), Odd Man Out (or back Thursday fortnight), Hunt the Clipper (or what of our Transatlantic services?), and Kick in the Chin (or what the Internal Air Line operators got).

But, after all, they are jolly decent chaps, and we must never forget that some of them have forsaken modest salaries to join up (in what have been called the non-competent branches) as Major-Generals and Admirals.

We all go a trifle haywire in spring, and here's my contribution :—

Deputy Director Glue
Wore a hat of blackest hue
And under it a Piltdown skull
No wonder he was deadly dull.

Now he's Air Vice-Marshal Glue
Superior to me and you
His hat's a thing of echoing brass
With underneath—the same old Ass.

Dodging a well-deserved fusillade of missiles, I hurriedly change the subject, to record the inauguration on May 1 of an extra Sabena service to Brussels, which has necessitated a change of timetable. Departures from Shoreham are 8.45

a.m. and 5.30 p.m., arrivals at Shoreham now being at 10.30 a.m. and 5.0 p.m. An old acquaintance in a nice new suit of bright orange is the Sabena Savoya Machetti air liner, which we have not seen previously since Croydon days.

Chief air hostess of K.L.M., Miss Ina Boomkamp, came over here and was "In Town To-night" at the B.B.C. last Saturday, chatting of her experiences when taking a 'plane-load of kiddies out East to join their parents. Miss Boomkamp is not only a charming personality, but a real business woman and organiser, and much of the success of the K.L.M. air hostess scheme is due to her capability as the chief of this not very easily run department.

A. VIATOR.

HERE and THERE

Air Mail to New Zealand

THE Postmaster-General announces that air mail for New Zealand, which has hitherto been forwarded by air as far as Sydney and thence by surface route, will in future be conveyed by air right through to New Zealand. There will be no alteration in the existing rate of 1s. 3d. per half ounce (postcards 7d.).

The Mitsubishi MC20 Transport

STATED to have a maximum speed of 266 m.p.h. with a cruising speed of 200 at 10,000ft., a new Japanese all-metal low-wing transport is offered for export. With a single fin and rudder, it is very "Douglas" in appearance and has accommodation for 11 passengers and 4 crew. Its engines are Nakajima double-row radials of 850 h.p., capable of developing 1,040 h.p. each. Its empty weight is 11,905lb., which, with a disposable load of 6,395, gives a gross loaded weight of 18,300lb. Its wing loading is 24lb./sq. ft., and landing speed is given as 74 m.p.h. Span is 74ft. and length 52ft. 8in. An automatic pilot and dual control are fitted.

Col. H. Burchall Retires

COLONEL H. BURCHALL, D.S.O., an assistant director-general of the British Overseas Airways Corporation, is retiring. Colonel Burchall brought to Imperial Airways, which he joined in 1925, a reputation in the spheres of engineering and aircraft production. He was responsible for the survey of the Empire route between Egypt and India, and became Imperial Airways' first manager in Egypt.

He returned to England in 1928 and became assistant general manager, and afterwards general manager. Subsequently he was appointed, with Major J. R. McCrindle, as one of the two assistant director-generals of the newly formed British Overseas Airways.

Extra Service to Dublin

AN official statement by Aer Lingus, Teóranta (Irish Air Lines) announces that, after May 6, services between Dublin and Liverpool are augmented by a daily return service to be operated by West Coast Air Services, Ltd. The new 21-seater Douglas DC3 recently purchased by Aer Lingus was placed on the service on May 7.

Travellers to England may now leave Dublin at 9.30 a.m. or 2 p.m. each week-day. The Liverpool to Dublin service departs at 11 a.m. and 2 p.m. each week-day. All services are scheduled to make the trip in 80 minutes. A complete time-table may be obtained from Aer Lingus, Teóranta, 39, Upper O'Connell Street, Dublin, or from any travel agent.

The added comfort of the new DC3 will be a great incentive to travellers to go by air. An air hostess will be carried and it will be possible to obtain light refreshments on board. No alterations in the existing fares are announced.

Scottish Air Services

PERMISSION has now been granted by the Air Ministry for the recommencement of a number of Scottish air services during May. This news is particularly welcome at a time when internal air transport is practically at a standstill in England. The pre-war service between Glasgow, Belfast, and Liverpool has been reintroduced. This route, operated by Railway Air Services, allows business men to leave Glasgow in the morning, transact business in Belfast, and return the same evening. It is also possible to return from Liverpool on the same day, although the time available for business is necessarily shorter.

It is also hoped to start operations again on the Hebrides route within the next week or two. This route, going by Tiree, Barra, Benbecula and North Uist from Glasgow, is operated by Scottish Airways, and will be flown three days each week.

About the same time it is planned to open up a new route, allowing a direct flight to be made between Glasgow and Stornoway for the first time. Both of these services should have started last month, but shortage of aircraft caused a postponement. New aircraft are now forthcoming, however, and it is practically certain that the services will go into operation soon. This means that Scottish air routes operating during the summer will total something like pre-war mileage. The Glasgow-Inverness route by Perth has been withdrawn, but the new route to Stornoway re-establishes the daily mileage. The new summer schedule also includes an evening service from Glasgow to Campbeltown, which will commence on May 13.

Delivery by Sabena

THE Aer Lingus Douglas DC3 which "A. Viator" described in his contribution in the April 25 issue as having been delivered from Holland, actually came from Belgium. Shipped to Antwerp, it was assembled there and flown via England to Ireland by Mr. Van Ackere, senior pilot of Sabena. For about ten days Mr. Van Ackere stayed in Dublin giving the Aer Lingus pilots the benefit of his extensive experience with Douglases.

Canadian Training News

MORE than three hundred airmen completed in April their eighteen-week course at the R.C.A.F. Technical Training School, St. Thomas, Ontario. It is the first class to be graduated since the school was established and instruction commenced on December 4 last. Of these airmen 132 are aero-engine mechanics, 123 airframe mechanics, 28 fabric workers and 33 are sheet metal workers.

"Dominion Skyways (Training), Limited," of which the principal shareholder is Dominion Skyways, Limited, has been charged with the responsibility of operating No. 1 Air Observers' School, to be established at Malton, Ontario. This is the first air observers' school to be established under the new arrangement, whereby certain commercial aviation companies will be invited to co-operate with the R.C.A.F. in the promotion of the British Commonwealth Air Training Plan.

No. 1 Elementary Flying Training School, at Malton, Ontario, will similarly be the first flying school and will be run by the Malton Flying Training School, Ltd. While the necessary training and instructional staffs will be furnished by the R.C.A.F., it will be possible to utilise the services of individuals who could not be employed in schools manned wholly by service personnel. Moreover, this plan has the advantage of decentralising management and the R.C.A.F. staff will thereby be enabled to concentrate more fully on the advanced stages of training.

Two "relief aerodromes" will be established in conjunction with the "main aerodromes" for each of the sixteen service flying training schools. No hangars or other structures will be erected on these aerodromes, which will be utilised principally for practice landings. Provision will be made for night flying at one of them.

FURTHER RATIONING OF PAPER

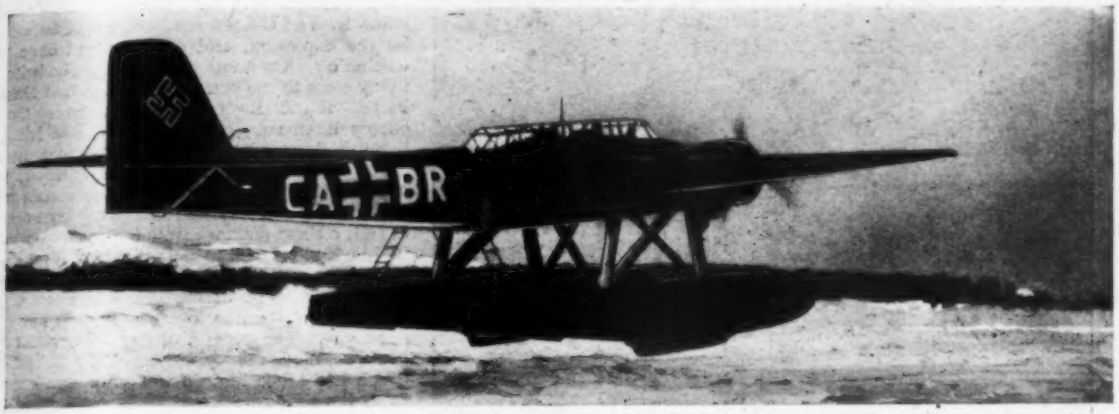
A Definite Order to Newsagents is Essential

FURTHER drastic rationing of paper supplies by the Government in consequence of the extension of the war to Scandinavia and partial cessation of imports, means that paper must be conserved in every possible way. One result of this latest restriction is that publishers are compelled to cease supplying journals to newsagents on sale or return. It is thus imperative for readers who wish to avoid disappointment to request a regular copy of *Flight*, as newsagents in future will requisition from the publishers only those copies for which they have received a definite demand.

Thus to ensure a regular copy of this journal, tell your newsagent, without delay, to reserve you a copy each week. The order can be countermanded at any time in the event of change of address.

WAR in the AIR

Withdrawal from Namsos : Bombing the Aerodromes : Damage at Clacton



The Heinkel concern has developed runners which can be applied to the undercarriage of a floatplane and enable it to operate from snow-covered ice. Here is an He 115 seaplane so equipped.

THE most important news since our last issue was the statement made by the Prime Minister on Thursday, May 2, in the House of Commons, in which he announced the withdrawal of the British troops from Aandalsnes, the landing place to the south of the German base at Trondhjem. Namsos has also been evacuated. The withdrawal was very skilfully carried out, and we did not lose a man in the process. This means that the Germans can effect a junction between their troops based on Oslo and those in Trondhjem without further opposition, and that for the moment they will have undisputed control of all Southern Norway. Our men, and presumably the French Chasseurs Alpins, remain in possession of their positions round Narvik, which ought soon to fall into our hands.

This Allied withdrawal is admittedly due to the action of the German aircraft in preventing the landing of heavy armament from our transports. We have been unable to stop their action, for only a few anti-aircraft guns had been got ashore, while the fighters which had tried to work from frozen lakes had been harried and had found the lakes very unsatisfactory as air bases. The Germans had seized all the important aerodromes in Norway in their first rush, Stavanger being the most important of them, and despite the valiant and persistent efforts of the R.A.F. to put those aerodromes out of action, German bombers continued to attack our troops and to bomb to bits the towns, Namsos and others, round which our men were lying. They also did much damage to the landing stages at the little harbours where our men had disembarked and where it had been hoped to unload the heavy guns, tanks, and other necessary weapons and impedimenta. The German aircraft, working with their Army, and with their bases protected from ground attack by that Army, proved most efficient long-range guns—which is the primary rôle of the bomber aeroplane.

We do not yet know all the facts about this campaign, but judging from what we do know we can hardly help reflecting on what seems to be the failure of bombers to throw aerodromes out of action. The subject was considerably discussed by thoughtful writers before the war, and a study of their articles left one with a feeling of doubt as to the profit to be derived from such action. The history of the last month has done nothing to dispel that doubt. Stavanger is acknowledged to be the most important air base in Norway, and it has been hammered with little cessation by the R.A.F. and once bombarded by the Fleet. The aerodromes at Aalborg and Oslo have also received their meed of attention. Numbers of German machines on all the landing grounds must have been destroyed, and the lives of the ground parties which had to live and work on them or round them must have been made miserable—when they were not cut short. Yet for all that a constant stream of German bombers raided Aandalsnes, Namsos, and the other British bases, and, in effect, drove our troops out of the country.

As an arm of the German Army, the *Luftwaffe* has justified its existence and its special Army training, and we may pay a tribute to the determination of the German airmen who continued the work in spite of all that the opposing bombers could do to stop them. We had already concluded that bombers were powerless to stop the work of a Fleet at sea, and now it looks as if we must conclude that bombers are powerless to stop the work of an enemy aerodrome. That bombers could, when unopposed by fighters or even by an adequate number of A.A. guns, put a stop to the operations of ground troops had never been in question. In fact, it is surprising that our troops were able to land and to re-embark without loss. That our heavy arms could not be landed while the *Luftwaffe* was able to operate was not in the least surprising.

The Clacton Crash

BEFORE proceeding to deal with the individual events of the last week, we may mention an incident which, though not of great importance in itself, aroused a good deal of interest in this country. On Tuesday night, April 30, enemy aircraft approached the East Coast at several points, apparently with the intention of laying mines. One at least approached Clacton. No air-raid warning was sounded, but anti-aircraft guns opened fire and seem to have hit a Heinkel 111. The pilot must have realised that he could not get home, so he came inland over Clacton and flew round at a low height for over half an hour, dropping flares and evidently looking for a place to land. Soon after midnight the machine crashed, perhaps through having hit a house or a tree, and came down on top of a lot of houses. A mine which it was carrying exploded and caused wide havoc. At least fifty houses were either destroyed or so badly damaged that they will

A Lockheed Hudson of the Coastal Command has a look-see in a typical Norwegian fjord. The Hudsons have been doing magnificent work off the Norwegian coast.

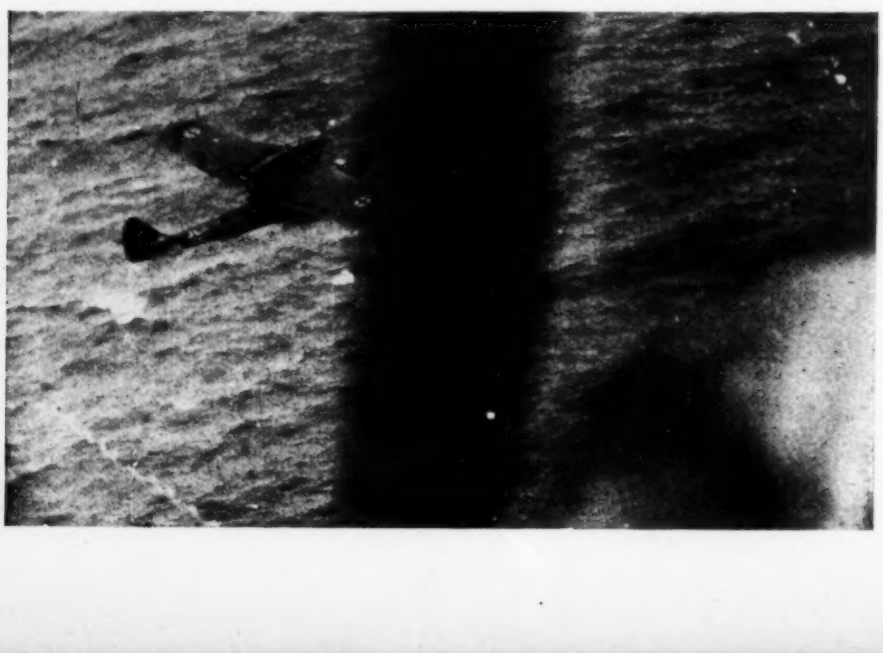
WAR IN THE AIR (CONTINUED)

have to be demolished. One married couple and one other person were killed and nearly 200 people were injured, many of them by broken glass. Over thirty serious cases were taken to hospital. Of course the crew of the Heinkel were themselves killed.

Apart from the success of the gunners in hitting the raider, the satisfactory feature of the incident was the splendid way in which all the A.R.P. organisations of Clacton came into action. In the shortest possible time the rescue parties and ambulance squads had dealt with all the injured. Some people, however, are asking why nothing could be done during the half hour or more in which the machine was flying low over the town.

Now to return to operations off Norway. Some details have been made public of the work of the Coastal Command during the campaign. Their flying boats have landed British experts at various points on the coast, and their aircraft have also explored and photographed nearly all if not quite all the fjords in the area of operations. On one occasion a photographer saw a speck in his view-finder, which on closer inspection proved to be a U-boat lying in shallow water close to the shore in a fjord. It had no chance of submerging, and the Sunderland promptly dropped two bombs. One hit the submarine on top; the other burst beside and below it. The U-boat was lifted out of the water by the explosion, and could be put down as written off. On another occasion a Sunderland flying close to the surface of the sea near Molde Fjord, found itself directly beneath three enemy bombers, Junkers 88s. It had left its base in Scotland and had landed in a fjord near Molde alongside a British destroyer, to which it had been sent to deliver certain information. Scarcely had the flying boat come to rest, a short distance from the warship, when twelve Junkers 88s, in four flights of three, appeared over the town of Molde and proceeded to bomb it. The dozen enemy bombers next turned their attention to the flying boat and the destroyer. The captain of the flying boat had just boarded the destroyer when a whaler which had taken him off was sunk by a bomb. Both the flying-boat and the destroyer had to take avoiding action from the attack, during which one stick of bombs was aimed at them unsuccessfully from each of the three groups of Junkers. After half an hour, its mission completed, the flying boat took off, its engines very hot from continuous taxi-ing over the fjord to evade the repeated attacks. It had just become air-borne when it was intercepted by a Messerschmitt 110. Bursts of machine-gun fire were exchanged. After the flying boat had fired about 700 rounds the Messerschmitt glided fast towards the shore, apparently in difficulties. When the flying boat returned to its base its crew learned that a message had been received from a British officer at Molde stating that the Messerschmitt had crashed.

The captain of the Sunderland flying boat, a flight-lieutenant, described his experiences on his return. He said: "We seemed to spend most of our time hopping from one hot spot to another. It is extraordinary that none of us was even scratched. As we got out of the whaler which took us to the destroyer a bomb dropped in the sea close beside the boat. The naval ratings who manned the whaler and I had just reached the destroyer's deck when a bomb explosion blew the empty boat right out of the sea in several pieces. Even the short return passage to my aircraft from the destroyer in another boat was an adventurous trip. The Junkers were droning overhead in a continuous procession, dropping their bombs all around. Their aim was good—but not good enough. My co-pilot whom I had left in the Sunderland was able to avoid damage by taxi-ing about, and we in the small boat also steered clear of the bursting bombs. We had hardly got in the air again when a Messerschmitt 110 attacked us in a shallow dive.



A Dornier Do 18 flying boat as seen from a Blenheim, which just after this picture was taken shot it down into the sea.

A recent picture of a Heinkel He 111K bomber of the newest type. The wing shape and the characteristic tilting of the engines are evident. The machine is finished in pale blue on the under surfaces, the remainder being black.

Our guns went into action at nice range, and a moment later the Germans sheered off, losing height rapidly. It was a very brief fight, lasting only a few seconds, but we saw many of our tracer bullets entering the Messerschmitt which, we were delighted to learn later, had crashed."

A flying officer who comes from Calgary has described a flight to Oslo in the search for enemy warships and transports: "'Oslo for you,' we were told, and at once we became busy. The captains of the aircraft detailed for the flight got to work, installing flying kit and so on, and seeing to it that everything was checked up before we took off. I wouldn't say that most of us are nervy or hit up. We are certainly not. The thing you most feel—at least that I most feel—is a sort of eager impatience to get into the air and be off. It's the kind of feeling one has before an important game begins, only far more intense. Of course, once you're at it you're all right, and the only thought in your head is the job in hand. At five o'clock, having tucked in as much tea as we could, we trooped into the Operations Room to be briefed. Being briefed means being told your target, what the job exactly is, and so forth. At 6.30 p.m. we began to dress for the trip. Just before seven o'clock we got into the aircraft. My fellow pilot and navigator was a Canadian, and with us were two Yorkshiremen and a Scot. There was a last check to make sure that our rations were aboard—six flasks of hot coffee, biscuits, nuts, raisins, chewing gum—then we took off. It was a clear, calm evening with a layer of cloud at about eight thousand feet, and up we climbed, heading for the sea. On we went, seeing nothing below us till we were about three-quarters of the way to our target. Then suddenly the sergeant observer told us we had reached the Skaggerak, and we became all keyed up.

A Beautiful Sight

"It was after midnight when we struck the coast, and followed the line, peering down at the dim fjords for signs of enemy shipping. All the towns, including Kristiansand, were lit up; there was no black-out, and the snow-covered mountains behind Oslo Fjord showed up beautifully. There was a moon to aid visibility, and we came down into air that we could breathe. There was no need now to use our oxygen masks. For the best part of an hour we cruised about looking for possible targets such as enemy warships, naval auxiliary vessels or transports. The inspection was thorough, but no ships were seen, and so, disappointedly, we had to turn back for home. Anyhow, we did bring back some useful information, though we missed the excitement of bombing a German warship. It is always exciting to drop a few bombs. The upward lurch as you let go heavy fellows—the sight of them hurtling down to earth or towards their target on the sea, the explosion, the flash of light, the growing fire which, looking back, you may see—yes, these are the visible signs which enable you to go back to your base and report that you have achieved the task set you."

On the night of Monday, April 29, the Fornebu airport near Oslo was raided for the fourth time by the Bomber Command. The raids started at midnight and lasted for over an hour. One of our machines did not return. Next day (Tuesday, April 30), as large concentrations of aircraft had been reported in Denmark and Norway, strong bomber forces attacked Aalborg, Fornebu, and Stavanger during the night, and kept on raiding on the next morning.

In the four days that had elapsed since the last raid on Stavanger much of the damage previously inflicted on the landing ground had been made good and large numbers of enemy aircraft were seen on the aerodrome, dispersed round the boundary and hidden in adjoining thickets, when the advance guard of the British raiding force reached the air base in the late afternoon. High explosives and incendiary bombs were dropped on the aerodrome and among the stationary aircraft, and were seen to burst within the target area. Meanwhile enemy fighters had taken off to engage the raiders, and in the course of a series of running fights one Messerschmitt 109 was shot down by the rear gunner of a Blenheim who, after firing a short burst, saw his victim turn to port and fall off in a spin. A cloud of black smoke came from the Messerschmitt engine, and, still spinning, it crashed head-on into the sea. Neither the British pilot nor his observer was aware of their success at the time as their inter-communication set had been put out of action. Another British bomber was attacked by four Messerschmitt 110 twin-engined fighters, but by skilful evasive action the pilot was able to elude his opponents.

Bombers Fight Messerschmitts

FOLLOWING soon after the first raid came another and still stronger force of bombers. The aerodrome was still plainly discernible in the evening light, and as the raiders peered at the target, enemy fighters could be seen taking off to intercept and engage them. Approaching the aerodrome in a shallow dive the British bombers launched their attack from different directions, battering the ground defences and registering hits on all parts of the aerodrome. Salvos of high explosive bombs were seen to straddle the principal runways and to explode in a line from the centre of the north-west boundary of the aerodrome. Other heavy bombs burst parallel to the runway and along the side of the landing ground close to enemy aircraft. Buildings on the north side of the aerodrome were hit, and several fires, visible from a long distance, were seen to break out on the north and north-west edges of the aerodrome and near the south end of the adjoining seaplane base. Fighter opposition was intense, and on leaving the target area after dropping their bombs two of our aircraft were seen to be pursued and vigorously engaged by four Messerschmitt 109 and Messerschmitt 110 fighters. A Messerschmitt 109 closing in on the rearmost bomber was seen to burst into flames and to crash into the sea. A minute later the British bomber came under the concentrated fire of several attackers and was forced down into the water. Two other British bombers were also engaged by two Messerschmitt 109 fighters, which, attacking from astern and on the quarter, opened fire at 500 yards, closing to 200 yards. As the British formation dived from 2,000ft. almost to sea level their tail gunners returned

WAR IN THE AIR (CONTINUED)

the fire, and after four short bursts one of the enemy aircraft burst into flames and crashed into the sea, its companion then breaking off the engagement. Another enemy fighter—a Messerschmitt 110—made a succession of attacks on two or more of our aircraft. Tracers were seen to ricochet off the wing and fuselage of the enemy fighter, and after the British bombers had fired over 3,000 rounds a flash was seen in the Messerschmitt from the rear gun position as though an explosion had taken place. The third phase of the attack on Stavanger came after dark when another force of bombers subjected the aerodrome to a series of raids that continued into the early hours of the morning. Strong opposition was encountered from ground defences, but employing varying tactics of approach the aircraft succeeded in reaching their objective and inflicting still further damage on the air base.

Aalborg and Fornebu aerodromes were attacked during the night by other aircraft from Bomber Command. High explosive and incendiary bombs were dropped on the Danish air base. A fire, visible some thirty miles away, was started by the first attack on Fornebu. Later aircraft arriving just before midnight were guided to their target by this fire as it burnt fiercely on the edge of the aerodrome. Guns placed round the aerodrome and on promontories east and south of it attempted to screen the target with a barrage of fire, but could not hold off the attackers, who ran the gauntlet of the powerful defences and dropped bombs on the hangars and runways. As each aircraft descended to attack it was met by a concentration of fire from the German guns, and numerous searchlights, working in close co-operation with the gunners, added to the difficulty of the raiders. Bombs were dropped on the north side of the aerodrome where several aircraft were believed to have been parked; one large hangar was hit and set on fire, and new fires were started with incendiary bombs.

Seven British aircraft of the large force employed—one of the strongest yet engaged in a single night operation—have failed to return. On the credit side three important enemy bases have been heavily bombed and damaged, and four enemy aircraft are known to have been destroyed in air action, in addition to a much larger number that may have been hit in the air or destroyed or damaged on the aerodromes in the attack.

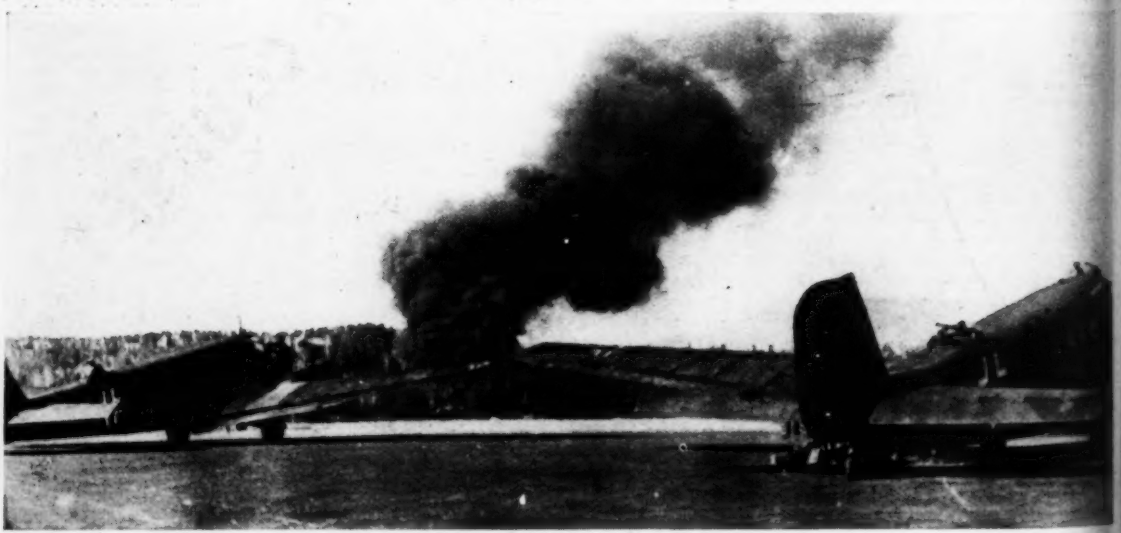
When the morning raids started on Wednesday, May 1, no enemy fighters rose against our bombers. The damage done during the night was seen, and more was done. This time all our aircraft returned safely. Stavanger was raided again on the Wednesday afternoon and early on the Thursday morning. Aalborg and Fornebu were visited again that night. We suffered no casualties in these raids.

The Fleet Air Arm

THE Fleet Air Arm has participated most gallantly in the work off Norway. It is evident that aircraft carriers must have approached the Norwegian coast, to shorten the range for the F.A.A. machines, for Rear-Admiral Fraser, Third Sea Lord, in a speech on Friday, May 3, told how a midshipman pilot ran out of petrol, landed on the ground where nobody thought he could land, "scrounged" some petrol, and returned to his ship. Moreover, it has been announced that on Sunday, April 28, seven German aircraft attacked a British carrier, but three naval aircraft went for them, shot down two, and broke up the attack. The naval machines have also bombed aerodromes at Vaernes and Thanshavn, places which have not been mentioned in Air Ministry communications, and did much damage. In the course of the operations the F.A.A. destroyed at least ten enemy aircraft and damaged many others. In some cases the pilots flew on in their eagerness until their petrol was exhausted. "In most cases," said Admiral Fraser, "the Navy had been able to recover the crews." In the operations between April 24 and May 3 the F.A.A. lost the crews of six aircraft. The Admiralty has sent a message: "We are proud of the Fleet Air Arm."

The *Luftwaffe* has now destroyed four more moving warships with bombs. One was the sloop *Bittern*, 1,190 tons. She had been in action all day, fighting hard, and had shot down one enemy aircraft, besides damaging others. It was reckoned that 150 bombs were aimed at her, of which 149 missed. At last her ammunition was practically exhausted, and then she was hit and set on fire. Her crew were taken on board another warship, and the *Bittern*, being likely to become a danger to navigation, was sunk by our own forces. The others were the destroyers H.M.S. *Afridi*, the French *Bison* and the Polish *Grom*.

Since the German invasion of Norway, H.M. ships have been exposed to repeated enemy bombing attacks. At least twenty enemy aircraft have been shot down and others damaged by the anti-aircraft gunfire of the Fleet.



The propaganda caption issued with this picture taken in Norway states that the conflagration was caused by a crashed British aircraft. The machines on the aerodrome are Junkers Ju 52 bomber transports; they have gun positions just behind the pilots' cockpit and further aft on top of the fuselage.